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GEORGE C. MARSHALL SPACE FLIGHT CENTER

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COMPUTER PROGRAM FOR REDUCTION OF NEUTRON ACTIVATION FOIL DATA

By

L. K. Zoller

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ABSTRACT

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In order to provide a rapid, consistent, and accurate means for reducing and organizing "raw" foil counting data from neutron activation foils, a computer program has been written for utilization on the IBM 704 and 7090 digital computers. This computer program features flexibility to provide for nearly all commonly encountered data acquisition and data reduction techniques. Further, it is designed to provide the maximum information obtainable from the input data in the event that a program "stop" is encountered.

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ENGINEERING MATERIALS BRANCH
PROPULSION AND VEHICLE ENGINEERING DIVISION

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DEFINITION OF SYMBOLS

SYMBOL	DEFINITION
A_c	Saturated activity of foil, counts per minute-gram of target isotope-watt
A_d	Saturated activity of foil, disintegrations per second-gram of target isotope-watt
a_t	Percent weight abundance of target isotope
B	Corrected background counting rate data
B_x	Background counting rate data for specified event X
C	Corrected counting rate data
C_x	Counting rate data for specified event X
F	Foil saturation factor
M_f	Foil mass
N_t	Number of target isotope atoms
p_i	Reactor power at the ith power level
S	Percent root-mean-squared standard deviation
S_x	Percent standard deviation for the specified event X
T_x	Time at occurrence of specified event X
t_x	Duration of specified event X
W_f	Atomic or molecular weight of foil
ϵ	Counter efficiency factor
λ	Foil decay constant

DEFINITION OF SYMBOLS (Concluded)

SYMBOL	DEFINITION
μ	Radiation self-absorption coefficient for the foil
σ	Effective reaction cross section
τ	Counter resolution time
Φ	Effective energy-integrated neutron flux

SUBSCRIPTS

B	Foil background data
C	Foil counting data
i	Reactor power level
m	Measured data
n	Interval for multiple decay data
P	Pre-irradiation foil counting data
R	Counter resolution corrections
S	Foil self-absorption corrections
SDT	Reactor shutdown time or foil removal whichever is earlier

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SUMMARY

In order to provide a rapid, consistent, and accurate means for reducing and organizing "raw" foil counting data from neutron activation foils, a computer program has been written for utilization on the IBM 704 and 7090 digital computers. This computer program features flexibility to provide for nearly all commonly encountered data acquisition and data reduction techniques. Further, it is designed to provide the maximum information obtainable from the input data in the event that a program "stop" is encountered.

INTRODUCTION

One of the more convenient methods for measuring and analyzing neutron spectra entails the use of neutron activation foils. These foils are generally metallic or inorganic samples which are varied in size according to the material and intended usage, but are typically $1/4$ inch to $1\frac{1}{2}$ inches in diameter and a few mils to $1/4$ inch in thickness.

The neutron activation foil technique is used because neutrons of given energies react uniquely with all elemental isotopes. Neutron capture reactions result in unique isotopic products, many of which are unstable and, therefore, dissipate their excess energy by emission of specific types of radiation at specific energies at specific exponential rates.

Having exposed a foil material to neutron radiation, the type, energy, and rate of radiation emission from the unstable products may be determined with electronic instruments which are sensitive to ionization processes. The experimental technique involves determining, or counting, the number of induced ionizations in the detector per unit time over a period of time. These foil counting data may be reduced to useful quantities by application of many laborious and intricate corrections.

The neutron-activation-foil data reduction program is intended to provide a flexible and rapid method for organizing and reducing neutron activation foil counting data into a useful form. The program format was derived by utilizing the most advantageous features of the several counting facilities with which the author is familiar. The program was written (FORTRAN II) for the IBM 704 or 7090 digital computer with peripheral tape units for magnetic tape input and output; utilization of these tape units requires a punched card to magnetic tape converter and a printing unit for magnetic tape. If these peripheral units are not available, the program can be converted easily to other modes of operation.

This program was designed to provide sufficient output data to permit reproduction of each and every computation made by the machine even in the absence of the original data input sheets. Likewise, to provide the user with the maximum amount of information in the event of unsuccessful processing, error returns are printed out by the machine whenever common errors are detected in the input data. Moreover, in some instances, consistency checks are built into the program to provide a cross-check between input instructions and data; if a discrepancy appears, the program attempts to interpret the discrepancy, print out its interpretation, supply the necessary data from the stored input, and continue with the data reduction. In any event, the program has been designed to provide the maximum amount of useful data output whenever a program stop is encountered.

FOIL AND COUNTER IDENTIFICATION

For maximum utilization and flexibility of the foil data reduction program, it is recommended that the foils be identified by a six-digit number stamped or written on the foils. These six digits would provide identification as follows: the first two digits would be the

atomic number of the "target" element of the foil, the second two digits would provide a foil group identification, and the last two digits would provide the foil number within the specified foil group. Thus, the twenty-fifth copper foil in the third group of copper foils would be denoted as 290325.

The use of foil groups provides the opportunity to classify the individual foils of a particular element according to mass, size, composition, etc. For instance, it is highly improbable that, for general purposes, all of the foils of a specific element would have the same mass; thus, to eliminate the necessity of providing the individual masses of the foils or the necessity of using a possibly erroneous average mass, the foils may be grouped such that the foil masses are within given limits, say ± 1 percent. Similarly, it is sometimes desirable to have foils made so that the abundance of the target isotope may be specified. For example, it might be desirable to have indium-aluminum foils in which the indium abundance is varied to provide a variety of flux sensitivities; for this situation, the special foils could be assigned different group numbers to distinguish between the various indium 115 abundancies. The use of the foil grouping provides 99 groups of 99 foils each, or a total of 9801 foils of each element.

It is recommended also that the counters be identified by a number between 1 and 99. Since it is not always desirable or possible to count all of the foils under the same counting conditions, provision has been made in the program to identify up to nine counting conditions for each counter. These counting conditions may correspond to counting geometries, such as the use of risers, absorbers, or different counter shelves; or to counting techniques, such as counting irradiated sulphur foils as opposed to counting the residue after burning these foils. The purpose of specifying the counting geometry or technique is to permit proper assignment of the respective counter efficiency factors.

GENERAL INPUT DATA

The first block of data read into the machine is provided for identification of the program output; this information includes the users name and telephone number, the facility using the program, and the test or data identification.

FOIL CONSTANT INPUT DATA

The second block of data consists of the foil constants which are to be used during the foil data reduction; these data include, for each type of foil:

The atomic number of the "target" element,
The foil group,
The reaction index,
The foil mass,
The foil diameter,
The foil thickness,
The atomic or molecular weight of the foil,
The abundance of the "target" isotope in the foil,
The reaction decay constant,
The effective reaction cross section,
The self absorption constant.

These data are called from machine memory through the use of an index comprised of the atomic number of the "target" element, the foil group, and the reaction index. The reaction index, indicating which of the various neutron induced reactions is to be considered, is included since it is often desirable to measure the decay of more than one of the resultant reaction products for a given foil. Since the various neutron-induced reactions result in different products, each with its characteristic radiation and decay rate, some provision must be made to insure the use of the proper constants.

If, as is the case for fission foils, the reaction products result in a multiplicity of exponential decays such that the measured decay rate deviates from a simple exponential function, one may use a program provision which permits assigning up to five exponential decay constants to be applied over specific time intervals of the foil decay. The easiest method for determining the values of the decay constants and their appropriate time intervals is to repeatedly count one or more of the typical foils in question for a relatively long period of time; having plotted the corrected count rate data as a function of time in minutes on semi-logarithmic paper, it is a simple matter to approximate the resultant curve with up to five straight lines. The values of the decay constants are, then, the absolute values of the slopes of the straight line approximations.

If the data to be reduced are for relatively thick foils, and if it is desirable to correct for self-absorption losses, a self-absorption constant may be supplied; this constant is equal to the product of the radiation absorption coefficient, typically in units of square centimeters per milligram, and the foil "thickness", in this case, in units of milligrams per square centimeter. The correction is, then,

$$C_S = C_m \frac{\mu d}{(1 - e^{-\mu d})}$$

where

C_S = count rate corrected for self-absorption,

C_m = measured count rate,

μd = self-absorption constant,

μ = absorption coefficient,

d = foil "thickness."

Similarly, if the atomic or molecular weight of the foil material and the effective reaction cross section are supplied, the program will also supply data in units of flux provided that counter efficiency factors are included in later input. Conversion of saturated activity to integral (energy) flux in the program assumes that a constant effective reaction cross section can be applied over the entire energy range of the reaction:

$$\Phi = \int_{E_T}^{\infty} \phi(E)\, dE = \frac{A_d}{N_t \sigma}$$

where

Φ = the effective integral neutron flux,

E_T = the effective reaction threshold energy,

A_d = the saturated disintegration rate,

N_t = the number of target isotope atoms,

σ = the effective reaction cross section.

The flux conversion should be used with care and discretion since determination of the effective reaction cross section presupposes some knowledge of the neutron spectrum. Those effective reaction cross sections which are commonly reported in the literature are generally integrated over a virgin fission spectrum; if the foil exposures are made in a perturbed spectrum, the flux conversion could be seriously erroneous. Moreover, "thermal" neutron fluxes are generally determined by using sub-cadmium disintegration rates and 2200 meters per second or Maxwellian-averaged cross section values. While this method is generally applicable to the difference of bare and cadmium-covered foil activities, it is definitely erroneous to apply the flux conversion to the individual foil data before the subtraction is made.

COUNTER CONSTANT INPUT DATA

The counter constant data, along with the aforementioned foil constant data, comprise a set of semi-permanent input data for the program. The counter constant data include, for each counter:

The counter number,
The counting geometry or technique index,
The atomic number of the "target" element,
The foil group,
The reaction index,
The counter resolution time,
The counter efficiency for the specified foil and geometry,
The uncertainty factor to be applied to the counter efficiency.

It is necessary to supply the program with counter constant data for each type and group of foil. If, however, the foils of a particular type are such that the foil counting efficiency factor is constant for all the foils regardless of grouping, provision has been made so that the counter constant data need be supplied only once, rather than for each group. It should be noted that if the efficiency factors are unknown or are not supplied, the program will reduce the data to

saturated activity at reactor shutdown time in units of counts per minute-gram (target isotope) - watt; it cannot, however, give the data in units of disintegration per second - gram (target isotope) - watt or in units of flux (neutrons per square centimeter - second - watt).

If the resolution time is known and is supplied, the program will correct the count rate data for loss of counts during the counter "dead time" as follows:

$$C_R = \frac{C_m}{1 - C_m \tau}$$

where

C_R = the count rate corrected for resolution losses,

C_m = the measured count rate,

τ = the counter resolution time.

FOIL EXPOSURE INPUT DATA

The foil exposure, or configuration, data include:

The configuration or irradiation identification,
The reactor power at each power level,
The duration of operation at each power level,
The time at reactor shutdown.

The time at reactor shutdown or foil removal, whichever is earlier, is included so that the foil decay time (i. e. , the time from the end of irradiation to the beginning of counting) may be determined. To provide versatility in the program, three methods of foil decay time determination are permitted.

If the counting facility is provided with digital timing devices which may be started at the conclusion of the foil irradiation so that the time recorded at counting is the actual decay time, <u>no</u> entry should be made for the time at reactor shutdown since the necessary time information will be supplied with the counting data as the time at counting.

The second method is to be used at facilities equipped with digital clocks set to record the time in minutes from midnight December 31 of each year. In this system, the time of completion of irradiation and the time at foil counting are to be recorded as elapsed time from the beginning of the year. The decay time is, thus, the difference of the two entries.

The third system is also indexed from the beginning of the year. This system, however, is to be used when it is desirable to record calendar times. The time entries are to be made as calendar date (month, day, and year) and military (24 hour) time; the program will convert these dates and times into elapsed time, in minutes, from the beginning of the year. The time conversion is made through the use of a calendar built into the program which will automatically correct for leap year when necessary. Another feature of this time system is that the program will automatically correct for a change in the year if, for example, the irradiation were completed near the end of the month of December and the foils were not counted until early in January.

The reactor power levels are specified as a power histogram. Under normal operation, involving short reactor periods, this approximation is negligible. If, however, a condition were to be experienced where the power buildup was on a very long period such that the foil activation was affected, the curve of reactor power as a function of time should be integrated from startup to power stabilization, and the resultant integrated power converted to an effective uniform power level.

After having read in the Configuration Data, the program computes the integrated power for each power level and sums these values for the entire irradiation:

$$P = \sum_i \frac{p_i t_i}{60}$$

where

P = the integrated power, watt-hours,

p_i = the reactor power at the ith level,

t_i = the duration of operation at the ith power level,

60 = the conversion from minutes to hours.

Rather than computing the foil saturation factor for each foil individually, the program computes this factor for each type of foil for which data were supplied under "Foil Constant Input Data." These saturation factors are indexed by foil type and stored in memory for use during the foil data reduction. The foil saturation factor is computed as follows:

$$F = \sum_i p_i \left(1 - e^{-\lambda t_i}\right) e^{-\left[\sum_i^{NP} t_i - t_i\right]\lambda}$$

where

F = the foil saturation factor,

p_i = the reactor power at the ith level,

t_i = the duration of operation at the ith power level,

λ = the decay constant for the foil.

FOIL COUNTING DATA

For full utilization of the foil data reduction program, it is strongly recommended that the foil counting data be recorded directly on program input data sheets. If the data are transferred from some other source, not only is another source of error being introduced, but the time and expense necessary to make the transfer of data compromises the efficiency of the automation provided by the program.

The foil counting data include:

The foil identification,
The pre-irradiation background data for the foil,
The time at counting,

The counter background data,
The foil counting data.

The program has been designed so that corrections may be made for naturally occurring background radiation in the foil. These data, referred to as the "pre-irradiation background data," are used particularly with fission foils or under conditions where the foils must be irradiated more than once. The corrected background, which is used in the data reduction, is obtained as follows:

$$B = B_C + (C_P - B_P)\, e^{-\lambda (T_C - T_P)}$$

where

B = background count rate applied to the foil reduction,

B_C = the background count rate at time of foil counting,

C_P = the pre-irradiation count rate,

B_P = the background count rate at time of pre-irradiation counting,

λ = the foil decay constant,

T_C = the time at foil counting,

T_P = the time at pre-irradiation counting.

The useful forms of the foil data are saturated activity and effective flux at the time of reactor shutdown or foil removal, if removal is prior to termination of the reactor run. Moreover, the saturated activity is useful in terms of both counts per minute and disintegrations per second. This computer program reduces the foil counting data to all three of these quantities, provided that sufficient data are included in the input. The foil data reduction processes in the program for computation of the saturated activity at the end of irradiation is as follows:

$$A_c = \frac{(C - B)\, e^{\lambda (T_C - T_{SDT})}}{(0.01)\, a_t\, M_f\, F} \quad \frac{\text{counts}}{\text{min - gm (target isotope) - watt}}$$

where

A_c = the saturated foil activity, in counts per minute-grams of target isotope-watt, at reactor shutdown time,

C = the foil count rate corrected for resolution and self-absorption losses,

B = the corrected background count rate,

λ = the foil decay constant,

T_C = the time at foil counting,

T_{SDT} = the time at reactor shutdown or foil removal whichever is earlier,

a_t = the percent abundance of target isotope,

M_f = the foil mass,

F = the foil saturation factor,

0.01 = the conversion from percent abundance to fractional abundance.

The foil saturated disintegration rate corrected to the end of irradiation, is given by:

$$A_d = \frac{Ac}{(0.01)\,(60)\,\epsilon} \quad \frac{\text{disintegrations}}{\text{sec - gm (target isotope) - watt}}$$

where

A_d = the saturated disintegration rate, in units of disintegrations per second-gram of target isotope - watt,

ϵ = the counter efficiency factor in percent,

0.01 = the conversion from percent efficiency to fractional efficiency,

60 = the conversion from minutes to seconds.

The effective neutron flux at the completion of irradiation is determined as follows from the saturated disintegration rate:

$$\Phi = \frac{A_d W_f}{N_o \sigma \; (10^{-24})} \quad \frac{\text{neutrons}}{\text{cm}^2 \text{ - sec - watt}}$$

where

Φ = the effective integral flux, in units of neutrons per square centimeter second - watt,

A_d = the saturated disintegration rate,

σ = the effective microscopic reaction cross section in barns,

10^{-24} = the conversion from barns to square centimeters,

N_o = Avogadro's number, 6.025×10^{23} atoms or molecules per gram atomic or molecular weight,

W_f = the atomic or molecular weight of the foil.

The above equations are used when simple exponential decays are experienced. As was mentioned earlier, the program is provided with an option for multiple decays. When this option is used, the following modifications are made in the data reduction:

$$F = \sum_{i}^{NP} p_i \left[1 - e^{-\left[\sum_{n}^{N} t_n \lambda_n + (t_i - \sum_{n}^{N} t_n)\, \lambda_{N+1} \right]} \right]$$

$$e^{-\left[\sum_{n}^{N'} t_n \lambda_n + (\sum_{i}^{NP} t_i - \sum_{n}^{N'} t_n)\, \lambda_{N'+1} \right]}$$

where $t_N < t_i < t_{N+1}$ and

F = the foil saturation factor,

p_i = the reactor power at the ith level,

t_i = the duration of operation at the ith power level,

λ_n = the decay constants for the n intervals,

t_n = the time intervals for the n decay constants.

The background correction is similarly:

$$B = B_C + (C_P - B_P)\, e^{-\left[\sum_n^N \lambda_n t_n + (T_C - T_P - \sum_n^N t_n)\lambda_{N+1}\right]}$$

where $t_N < (T_C - T_P) < t_{N+1}$ and

B = the background count rate applied to the foil data reduction,

B_C = the background count rate at time of foil counting,

C_P = the pre-irradiation count rate,

B_P = the background count rate at time of pre-irradiation counting,

λ_n = the foil decay constants for the n intervals,

T_C = the time at foil counting,

T_P = the time at pre-irradiation counting,

t_n = the time intervals for the n decay constants.

The saturated activity at the time of reactor shutdown is given by:

$$A_c = \frac{(C - B)\, e^{\left[\sum_n^N \lambda_n t_n + (T_C - T_{SDT} - \sum_n^N t_n)\lambda_{N+1}\right]}}{(0.01)\ a_t\, M_f\, F} \qquad \frac{\text{counts}}{\text{min-gm (target isotope) - watt}}$$

where $t_N < (T_C - T_{SDT}) < t_{N+1}$ and

A_c = the saturated activity at reactor shutdown time,

C = the foil count rate,

B = the corrected background count rate,

λ_n = the foil decay constants for the n intervals,

t_n = the decay time for nth interval,

T_C = the time at foil counting,

a_t = the percent abundance of target isotope,

M_f = the foil mass,

F = the foil saturation factor,

0.01 = the conversion from percent abundance to fractional abundance,

T_{SDT} = the time at reactor shutdown or foil removal.

The time value used with each of the n decay constants is obtained by first determining the number of time intervals spanned by the time period in question. Having determined the number of complete intervals, N, to be used, the program obtains the N+1th time value by subtracting the upper limit of the Nth interval from the time period; the program then uses the respective time interval widths, t_n, for the degraded values of n, i.e., N, N-1, N-2, ...

Statistical data are computed by the program and are provided for aid in the subsequent analysis of the data output. The percent standard deviations of the counting rate data are determined from the following formula:

$$S_C = \frac{100}{C}\left[\frac{C}{t_C} + \frac{B}{t_B} + \frac{B}{t_C}\right]^{1/2}$$

when

S_C = a percent standard deviation,

t_C = the duration of foil count,

C = the corrected foil count rate,

B = the corrected background count rate,

t_B = the duration of background count.

The root-mean-squared standard deviations of the final data are obtained as follows:

$$S = \left[\sum_{C}^{NC} S_C^2 + \sum_{i}^{NP} S_i^2 + S_\epsilon^2 + S_P^2 \right]^{1/2}$$

where

S = the root-mean-squared standard deviation, per cent,

NC = the number of counts,

S_C = the percent standard deviation of the count rate data,

NP = the number of power levels,

S_i = the percent uncertainty in the ith power level,

S_ϵ = the percent uncertainty in the counter efficiency factor,

S_P = the percent standard deviation of the pre-irradiation count rate data.

Since it is possible to specify in the input data which side of the foil was counted, the program will print out final values of the saturated activity and effective neutron flux for both sides (indicated as Numbered Side, NS, and Unnumbered Side, US), and then determine the averages of these values. For thicker foils, it is not always valid

to use the simple average of the activity measured on the two sides of the foil; therefore, reference should be made to the printout of the foil constant input data to determine the physical parameters of the foil before using the average activity computed by the program.

FOIL DATA SUMMARY

The last block of data is an option which may be used to organize and compile the foil data into a more immediately useful form. Regardless of the order in which the foil data are reduced, the final averaged values of the saturated activity may be tabulated by simply supplying the foil numbers in the desired order. Another option is provided in the data summary to give the difference in saturated activity of two foils, the sub-cadmium activity, for example.

SOURCE PROGRAM LISTING

To facilitate reading of the source program listing, Table 1 gives the symbols which were used in the equations and discussion in the text and the corresponding alpha-numeric designations which were used in the source program. Although laborious, the exact functioning of the program can be determined from the source program listing with the aid of the definitions given in Table 1 and reference to the text, program input instructions, and sample problem.

PROGRAM INPUT INSTRUCTIONS

The following instructions are to be used in filling out input data sheets for the program. Although IBM cards and columns are indicated below for each entry, reference should be made to either the input data sheets for the sample problem (Appendix I) or to the format statements (1000 series statements) of the source program listing to determine the proper way to enter the values since the input data embrace three types of numerical entries.

Type	Example	Data Entry
Integer	33	33
Fixed Point	17.62	17.62
Floating Point	8.762×10^{-3}	8.762 - 03

Table 1. Equation Symbols and Corresponding Alpha-Numeric Designations

Symbols Used in Text	Program Designation	Symbols Used in Text	Program Designation
A_c	CPM	S_P	PSTD
A_d	DPS	S_ϵ	EFFU (J)
a_t	ABD (I)	T_C	CT
B	BKGRB	T_P	PCT
B_C	BKG	T_{SDT}	SDT
B_P	PBR	t_B	BKG DR
C	CR	t_C	CTD
C_m	ACR	t_i	T(K)
C_P	PCR	t_n	Tn (I), $1 < n < 5$
C_R	ACRR	W_f	ATWT (I)
C_S	ACRRB	ϵ	EFF (J)
F	PNF (I)	μd	SELFA (J)
M_f	FMASS	λ	ALAM (I)
P	SP	λ_n	ALAM_n (I), $1 < n < 5$
pi	P (K)		
S	WSTDD	σ	XSECT (I)
S_C	STD	τ	RES (J)
S_i	EP (K)	Φ	FLUX

```
C      PROGRAM 185 FOR COMPUTING SATURATED FOIL
C     1ACTIVITY AT REACTOR SHUTDOWN TIME      MODIFIED 11/60
    1 DIMENSION FID(99),FMASS(99),ATWT(99),ABD(99),
     1ALAM(99),XSECT(99),SELFA(99),ALAM1(50),ALAM2(50),ALAM3(50),
     2ALAM4(50),ALAM5(50),T2(50),T3(50),T4(50),T5(50),
     3CTID(500),RES(500),EFF(500),EFFU(500),PNF(99),
     4P(10),EP(10),T(10),FLID(1000),GCPM(1000),GDPS(1000),
     5HCPM(1000),HDPS(1000),KID(10),KG(10),KD(10),KF(10),
     6HKF(10),HKG(10),SFID(10)
    3 WRITE OUTPUT TAPE 6,1000                                        TITLE
    4 READ INPUT TAPE 5,1001                                          NAME
    5 WRITE OUTPUT TAPE 6,1001                                        NAME
    6 READ INPUT TAPE 5,1001                                          FACILITY
    7 WRITE OUTPUT TAPE 6,1001                                        FACILITY
    8 READ INPUT TAPE 5,1001                                          TEST
    9 WRITE OUTPUT TAPE 6,1001                                        TEST
   10 READ INPUT TAPE 5,1002,NLAM
   11 WRITE OUTPUT TAPE 6,1003                                        HEADINGF
   12 DO 25 I=1,NLAM
   13 READ INPUT TAPE 5,1004,NOAT,IGP,IR,FMASS(I),DIA,
     1THK,ATWT(I),ABD(I),ALAM(I),XSECT(I),SELFA(I)
   14 ATNO=NOAT
 2014 GP=IGP
 3014 REA=IR
 4014 FID(I)=(ATNO*1000.0)+(GP*10.0)+REA
   15 WRITE OUTPUT TAPE 6,1006,I,NOAT,IGP,IR,FMASS(I),
     1DIA,THK,ATWT(I),ABD(I),ALAM(I),XSECT(I),SELFA(I)
   16 IF(ALAM(I))17,17,25
   17 READ INPUT TAPE 5,1007,NOAT,IGP,IR,ALAM1(I),
     1ALAM2(I),ALAM3(I),ALAM4(I),ALAM5(I)
   18 READ INPUT TAPE 5,1008,NOAT,IGP,IR,T2(I),T3(I),
     1T4(I),T5(I)
   19 T1=0.0
   20 WRITE OUTPUT TAPE 6,1009,NOAT,IGP,IR,ALAM1(I),T1,T2(I)
   21 WRITE OUTPUT TAPE 6,1009,NOAT,IGP,IR,ALAM2(I),T2(I),T3(I)
   22 WRITE OUTPUT TAPE 6,1009,NOAT,IGP,IR,ALAM3(I),T3(I),T4(I)
   23 WRITE OUTPUT TAPE 6,1009,NOAT,IGP,IR,ALAM4(I),T4(I),T5(I)
   24 WRITE OUTPUT TAPE 6,1042,NOAT,IGP,IR,ALAM5(I),T5(I)
   25 CONTINUE
   26 WRITE OUTPUT TAPE 6,1010                                        HEADING
   27 READ INPUT TAPE 5,1002,NCTR
   28 DO 31 J=1,NCTR
   29 READ INPUT TAPE 5,1011,ICOUT,ISHEL,NOAT,IGP,IR,RES(J),
     1EFF(J),EFFU(J)
 2029 CTR=ICOUT
 3029 SHEL=ISHEL
 4029 ATNO=NOAT
 5029 GP=IGP
 6029 REA=IR
 7029 CTID(J)=(CTR*1000000.0)+(SHEL*100000.0)
     1+(ATNO*1000.0)+(GP*10.0)+REA
   30 WRITE OUTPUT TAPE 6,1012,J,ICOUT,ISHEL,NOAT,IGP,IR,
     1RES(J),EFF(J),EFFU(J)
   31 CONTINUE
```

```
   32 READ INPUT TAPE 5.1002.NCON
   33 II=1
   34 WRITE OUTPUT TAPE 6,1013                                           CONFIG
   35 READ INPUT TAPE 5,1001                                             CONFIG
   36 WRITE OUTPUT TAPE 6,1001                                           HEADINGP
   37 WRITE OUTPUT TAPE 6,1014
   38 READ INPUT TAPE 5,1017,NP,KODE.MO,IDAY,IYR,
     1IHR,MIN,SDT,NF,IAUTO,NRUN
 2038 DAY=IDAY
 3038 HR=IHR
 4038 AMIN=MIN
   39 SP=0.0
   40 TTD=0.0
   41 DO 47 K=1,NP
   42 READ INPUT TAPE 5,1015,P(K),EP(K),T(K)
   43 PINT=(P(K)*T(K))/60.0
   44 SP=SP+PINT
   45 WRITE OUTPUT TAPE 6,1016,K,P(K),EP(K),T(K),PINT
   46 TTD=TTD+T(K)
   47 CONTINUE
   49 WRITE OUTPUT TAPE 6,1018,SP
   50 IF(SDT)2050,2050,84
 2050 IF(MO)3050,3050,51
 3050 SDT=0.0
 4050 GO TO 84
   51 TM=(HR*60.0)+((DAY-1.0)*1440.0)+AMIN
   52 LY=0
   53 LEAP=1956+(4*LY)
   54 IF(IYR-LEAP)57,70,55
   55 LY=LY+1
   56 GO TO 53
   57 GO TO (58,59,60,61,62,63,64,65,66,67,68,69),MO
   58 ASDT=TM
      GO TO (83,182,205),KODE
   59 ASDT=TM+44640.0
      GO TO (83,182,205),KODE
   60 ASDT=TM+84960.0
      GO TO (83,182,205),KODE
   61 ASDT=TM+129600.0
      GO TO (83,182,205),KODE
   62 ASDT=TM+172800.0
      GO TO (83,182,205),KODE
   63 ASDT=TM+217440.0
      GO TO (83,182,205),KODE
   64 ASDT=TM+260640.0
      GO TO (83,182,205),KODE
   65 ASDT=TM+305280.0
      GO TO (83,182,205),KODE
   66 ASDT=TM+349920.0
      GO TO (83,182,205),KODE
   67 ASDT=TM+393120.0
      GO TO (83,182,205),KODE
   68 ASDT=TM+437760.0
      GO TO (83,182,205),KODE
   69 ASDT=TM+480960.0
```

```
      GO TO (83,182,205),KODE
   70 GO TO (71,72,73,74,75,76,77,78.79,80,81,82),MO
   71 ASDT=TM
      GO TO (83,182,205),KODE
   72 ASDT=TM+44640.0
      GO TO (83,182,205),KODE
   73 ASDT=TM+86400.0
      GO TO (83,182,205),KODE
   74 ASDT=TM+131040.0
      GO TO (83,182,205),KODE
   75 ASDT=TM+174240.0
      GO TO (83,182,205),KODE
   76 ASDT=TM+218880.0
      GO TO (83,182,205),KODE
   77 ASDT=TM+262080.0
      GO TO (83,182,205),KODE
   78 ASDT=TM+306720.0
      GO TO (83,182,205),KODE
   79 ASDT=TM+351360.C
      GO TO (83,182,205),KODE
   80 ASDT=TM+394560.0
      GO TO (83,182,205),KODE
   81 ASDT=TM+439200.0
      GO TO (83,182,205),KODE
   82 ASDT=TM+482400.0
      GO TO (83,182,205),KODE
   83 SDT=ASDT
   84 WRITE OUTPUT TAPE 6,1019,SDT,MO,IDAY,IYR,IHR,MIN
   85 WRITE OUTPUT TAPE 6,1020                                    HEADINGN
   86 DO 118 I=1,NLAM
   87 PNF(I)=0.0
 2087 TD=TTD
   88 DO 116 K=1,NP
   89 TD=TD-T(K)
   90 IF(ALAM(I))93,93,91
   91 PNF(I)=(P(K)*(1.0-EXPF(-ALAM(I)*T(K)))*
     1EXPF(-ALAM(I)*TD))+PNF(I)
   92 GO TO 116
   93 IF(T2(I)-TD)96,96,94
   94 PNF(I)=(P(K)*(1.0-EXPF(-ALAM1(I)*T(K)))*
     1EXPF(-ALAM1(I)*TD))+PNF(I)
   95 GO TO 116
   96 IF(T3(I)-TD)100,100,97
   97 TD3=TD-T2(I)
   98 PNF(I)=(P(K)*(1.0-EXPF(-T(K)*(ALAM1(I)+ALAM2(I))))
     1*EXPF(-(ALAM2(I)*TD3)-(ALAM1(I)*T2(I))))+PNF(I)
   99 GO TO 116
  100 IF(T4(I)-TD)105,105,101
  101 TD4=TD-T3(I)
  102 TD3=T3(I)-T2(I)
  103 PNF(I)=(P(K)*(1.0-EXPF(-T(K)*(ALAM1(I)+ALAM2(I)+
     1ALAM3(I))))*EXPF(-(ALAM3(I)*TD4)-(ALAM2(I)*TD3)
     2-(ALAM1(I)*T2(I))))+PNF(I)
  104 GO TO 116
  105 IF(T5(I)-TD)111,111,106
```

```
 106 TD5=TD-T4(I)
 107 TD4=T4(I)-T3(I)
 108 TD3=T3(I)-T2(I)
 109 PNF(I)=(P(K)*(1.0-EXPF(-T(K)*(ALAM1(I)+ALAM2(I)
    1+ALAM3(I)+ALAM4(I)))))*EXPF(-(ALAM4(I)*TD5)
    2-(ALAM3(I)*TD4)-(ALAM2(I)*TD3)-(ALAM1(I)*
    3T2(I))))+PNF(I)
 110 GO TO 116
 111 TD6=TD-T5(I)
 112 TD5=T5(I)-T4(I)
 113 TD4=T4(I)-T3(I)
 114 TD3=T3(I)-T2(I)
 115 PNF(I)=(P(K)*(1.0-EXPF(-T(K)*(ALAM1(I)+ALAM2(I)
    1+ALAM3(I)+ALAM4(I)+ALAM5(I)))))*EXPF(-(ALAM5(I)
    2*TD6)-(ALAM4(I)*TD5)-(ALAM3(I)*TD4)
    3-(ALAM2(I)*TD3)-(ALAM1(I)*T2(I)))))+PNF(I)
 116 CONTINUE
 117 WRITE OUTPUT TAPE 6,1021,I,FID(I),PNF(I)
 118 CONTINUE
 120 DO 376 L=1,NF
2120 IF(IAUTO) 121,121,121
 121 READ INPUT TAPE 5,1022,IDA,IDG,NFL,IR,NC,ICOUT,
    1ISHEL,IP
 122 WRITE OUTPUT TAPE 6,1023,IDA,IDG,NFL
2122 IDL=(IDA*100)+IDG
 123 IF(IR)2123,2123,138
2123 FDL=IDL
 124 AFID=FDL*10.0
 125 DO 130 JJ=1,6
 126 AFID=AFID+1.0
 127 DO 129 I=1,NLAM
 128 IF(AFID-FID(I))129,143,129
 129 CONTINUE
 130 CONTINUE
 131 WRITE OUTPUT TAPE 6,1025,AFID
 132 NI=NC+IP+2
 133 DO 136 KK=1,NI
 134 READ INPUT TAPE 5,1001                                  INPUT
 135 WRITE OUTPUT TAPE 6,1001                                INPUT
 136 CONTINUE
 137 GO TO 376
 138 FDL=IDL
2138 REA=IR
3138 AFID=(FDL*10.0)+REA
 139 DO 141 I=1,NLAM
 140 IF(AFID-FID(I))141,146,141
 141 CONTINUE
 142 GO TO 131
 143 WRITE OUTPUT TAPE 6,1024,AFID
 144 IR=JJ
 146 IF(ALAM(I))147,147,148
 147 GO TO (150,152,154,156,158,159),IR
 148 GO TO (149,151,153,155,157,159),IR
 149 WRITE OUTPUT TAPE 6,1026                                N-G,S
     GO TO 160
```

```
  150 WRITE OUTPUT TAPE 6,1027                                          N-G,M
      GO TO 160
  151 WRITE OUTPUT TAPE 6,1028                                          N-P,S
      GO TO 160
  152 WRITE OUTPUT TAPE 6,1029                                          N-P,M
      GO TO 160
  153 WRITE OUTPUT TAPE 6,1030                                          N-A,S
      GO TO 160
  154 WRITE OUTPUT TAPE 6,1031                                          N-A,M
      GO TO 160
  155 WRITE OUTPUT TAPE 6,1032                                          N-2N,S
      GO TO 160
  156 WRITE OUTPUT TAPE 6,1033                                          N-2N,M
      GO TO 160
  157 WRITE OUTPUT TAPE 6,1034                                          N-F,S
      GO TO 160
  158 WRITE OUTPUT TAPE 6,1035                                          N-F,M
      GO TO 160
  159 WRITE OUTPUT TAPE 6,1036                                          MULT
  160 READ INPUT TAPE 5,1001                                            LOCATION
  161 WRITE OUTPUT TAPE 6,1001                                          LOCATION
  162 READ INPUT TAPE 5,1001                                            COMMENT
  163 WRITE OUTPUT TAPE 6,1001                                          COMMENT
  164 IF(ICOUT)170,170,165
  165 CTR=ICOUT
      SHEL=ISHEL
 2165 JCTR=(ICOUT*10)+ISHEL
 3165 GDI=IDG
 4165 CTRID=(CTR*1000000.0)+(SHEL*100000.0)+AFID
     1-(GDI*10.0)
 5165 DO 7165 J=1,NCTR
 6165 IF(CTRID-CTID(J))7165,174,7165
 7165 CONTINUE
 8165 CTRID=(CTR*1000000.0)+(SHEL*100000.0)+AFID
  166 DO 168 J=1,NCTR
  167 IF(CTRID-CTID(J))168,174,168
  168 CONTINUE
  169 WRITE OUTPUT TAPE 6,1037,CTRID
  170 RESL=0.0
  171 CEFY=0.0
  172 UEFY=0.0
  173 GO TO 177
  174 RESL=RES(J)
  175 CEFY=EFF(J)
  176 UEFY=EFFU(J)
  177 IF(LP)186,186,179
  179 READ INPUT TAPE 5,1038,KODE,MO,IDAY,IYR,IHR,MIN,PCT,
     1JPCOU,JPSHE,PBKCT,PBKDR,PCTD,PTCT
 2179 JPCT=(JPCOU*10)+JPSHE
 3179 DAY=IDAY
 4179 HR=IHR
 5179 AMIN=MIN
  180 WRITE OUTPUT TAPE 6,1039                                          HEADINGP
  181 IF(PCT)51,51,183
  182 PCT=ASDT
```

```
 183 PBR=PBKCT/PBKDR
2183 PCR=(PTCT/PCTD)-PBR
3183 PSTD=(100.0*SQRTF((PCR/PCTD)+(PBR/PCTD)+(PBR/
    1PBKDR)))/PCR
 184 PBSTD=100.0/SQRTF(PBKCT)
2184 TPSDT=SDT-PCT
 185 WRITE OUTPUT TAPE 6,1040,JPCOU,JPSHE,PCT,TPSDT,PBR,PBSTD,PCR,PSTD
 186 WRITE OUTPUT TAPE 6,1041                                          HEADINGC
 187 SUCPM=0.0
 188 SUDPS=0.0
 189 SUFLX=0.0
     STDU=0.0
 190 KI=0
 191 KJ=0
 192 KL=0
 193 LI=0
 194 SNCPM=0.0
 195 SNDPS=0.0
 196 SNFLX=0.0
     STDN=0.0
 197 MI=0
 198 MJ=0
 199 MK=0
 200 LJ=0
 201 DO 318 M=1,NC
2201 IF(IAUTO)202,202,3201
3201 READ INPUT TAPE 5,1055,IA, IB,       JCOU,JSHE,CT,TCT,CTD,IC,NS
4201 READ INPUT TAPE 5,1055,IA, IE.       JBCOU,JBSHE,BCT,BKGCT,BKGDR,IC,
    1IG
5201 IF(IE)7201,7201,6201
6201 WRITE OUTPUT TAPE 6,1058,M,IA,IB
     GO TO 318
7201 JCT=(JCOU*10)+JSHE
     JBCT=(JBCOU*10)+JBSHE
     IF(JCT-JBCT)8201,2203,8201
8201 WRITE OUTPUT TAPE 6,1059
     GO TO 2203
 202 READ INPUT TAPE 5,1038,KODE,MO,IDAY,IYR,IHR,MIN,
    1CT,JCOU,JSHE,BKGCT,BKGDR,CTD,TCT,NS
 203 JCT=(JCOU*10)+JSHE
2203 BKG=BKGCT/BKGDR
3203 DAY=IDAY
4203 HR=IHR
5203 AMIN=MIN
6203 ACR=TCT/CTD
 204 IF(CT)51,51,206
 205 CT=ASDT
 206 IF(IP)235,235,207
 207 DKY=CT-PCT
2207 IF(DKY)3207,3207,208
3207 JYR=IYR-1
     LY=0
4207 LEAP=1956+(4*LY)
     IF(JYR-LEAP)6207,7207,5207
5207 LY=LY+1
```

```
      GO TO 4207
 6207 DKY=CT+(525600.0-PCT)
      GO TO 208
 7207 DKY=CT+(527040.0-PCT)
      GO TO 208
  208 IF(ALAM(I))211,211,209
  209 ABKG=PCR*EXPF(-ALAM(I)*DKY)
  210 GO TO 236
  211 IF(T2(I)-DKY)214,214,212
  212 ABKG=PCR*EXPF(-ALAM1(I)*DKY)
  213 GO TO 236
  214 IF(T3(I)-DKY)218,218,215
  215 DT3=DKY-T2(I)
  216 ABKG=PCR*EXPF(-(ALAM1(I)*T2(I))-(ALAM2(I)*DT3))
  217 GO TO 236
  218 IF(T4(I)-DKY)223,223,219
  219 DT4=DKY-T3(I)
  220 DT3=T3(I)-T2(I)
  221 ABKG=PCR*EXPF(-(ALAM1(I)*T2(I))-(ALAM2(I)*DT3)
     1-(ALAM3(I)*DT4))
  222 GO TO 236
  223 IF(T5(I)-DKY)229,229,224
  224 DT5=DKY-T4(I)
  225 DT4=T4(I)-T3(I)
  226 DT3=T3(I)-T2(I)
  227 ABKG=PCR*EXPF(-(ALAM1(I)*T2(I))-(ALAM2(I)*DT3)
     1-(ALAM3(I)*DT4)-(ALAM4(I)*DT5))
  228 GO TO 236
  229 DT6=DKY-T5(I)
  230 DT5=T5(I)-T4(I)
  231 DT4=T4(I)-T3(I)
  232 DT3=T3(I)-T2(I)
  233 ABKG=PCR*EXPF(-(ALAM1(I)*T2(I))-(ALAM2(I)*DT3)
     1-(ALAM3(I)*DT4)-(ALAM4(I)*DT5)-(ALAM5(I)*DT6))
  234 GO TO 236
  235 ABKG=0.0
      PSTD=0.0
  236 IF(JCT)2236,2236,5236
 2236 JCOU=ICOUT
 3236 JSHE=ISHEL
 4236 GO TO 249
 5236 IF(JCT-JCTR)237,249,237
  237 CTR=JCOU
 2237 SHEL=JSHE
 3237 CTRID=(CTR*1000000.0)+(SHEL*100000.0)+AFID
     1-(GDI*10.0)
 4237 DO 6237 J=1,NCTR
 5237 IF(CTRID-CTID(J))6237,246,6237
 6237 CONTINUE
 7237 CTRID=(CTR*1000000.0)+(SHEL*100000.0)+AFID
  238 DO 240 J=1,NCTR
  239 IF(CTRID-CTID(J))240,246,240
  240 CONTINUE
  241 WRITE OUTPUT TAPE 6,1037,CTRID
  242 RESL=0.0
```

```
 243 CEFY=0.0
 244 UEFY=0.0
 245 GO TO 249
 246 RESL=RES(J)
 247 CEFY=EFF(J)
 248 UEFY=EFFU(J)
 249 IF(RESL)250,250,253
 250 BKGR=BKG+ABKG
 251 ACRR=ACR
 252 GO TO 255
 253 BKGR=(BKG+ABKG)/(1.0-((BKG+ABKG)*RESL)/60.0)
 254 ACRR=ACR/(1.0-(ACR*RESL)/60.0)
 255 IF(SELFA(I))256,256,259
 256 BKGRB=BKGR
 257 ACRRB=ACRR
 258 GO TO 261
 259 BKGRB=(BKGR*SELFA(I))/(1.0-EXPF(-SELFA(I)))
 260 ACRRB=(ACRR*SELFA(I))/(1.0-EXPF(-SELFA(I)))
 261 CR=ACRRB-BKGRB
2261 IF(CR)3261,3261,262
3261 STD=0.0
4261 CPM=0.0
5261 DPS=0.0
6261 FLUX=0.0
7261 DECAY=CT-STD
8261 GO TO 292
 262 STD=(100.0*SQRTF((CR/CTD)+(BKGRB/CTD)
    1+(BKGRB/BKGDR)))/CR
 263 DECAY=CT-SDT
2263 IF(DECAY)3263,3263,264
3263 JYR=IYR-1
     LY=0
4263 LEAP=1956+(4*LY)
     IF(JYR-LEAP)6263,7263,5263
5263 LY=LY+1
     GO TO 4263
6263 DECAY=CT+(525600.0-SDT)
     GO TO 264
7263 DECAY=CT+(527040.0-SDT)
     GO TO 264
 264 IF(ALAM(I))267,267,265
 265 CPM=(CR*EXPF(ALAM(I)*DECAY))/(PNF(I)*
    1FMASS(I)*ABD(I)*0.01)
 266 GO TO 290
 267 IF(T2(I)-DECAY)270,270,268
 268 CPM=(CR*EXPF(ALAM1(I)*DECAY))/(PNF(I)*
    1FMASS(I)*ABD(I)*0.01)
 269 GO TO 290
 270 IF(T3(I)-DECAY)274,274,271
 271 DCT3=DECAY-T2(I)
 272 CPM=(CR*EXPF((ALAM1(I)*T2(I))+(ALAM2(I)*DCT3)))
    1/(PNF(I)*FMASS(I)*ABD(I)*0.01)
 273 GO TO 290
 274 IF(T4(I)-DECAY)279,279,275
 275 DCT4=DECAY-T3(I)
```

```
276 DCT3=T3(I)-T2(I)
277 CPM=(CR*EXPF((ALAM1(I)*T2(I))+(ALAM2(I)*DCT3)
   1+(ALAM3(I)*DCT4)))/(PNF(I)*FMASS(I)*ABD(I)*0.01)
278 GO TO 290
279 IF(T5(I)-DECAY)285,285,280
280 DCT5=DECAY-T4(I)
281 DCT4=T4(I)-T3(I)
282 DCT3=T3(I)-T2(I)
283 CPM=(CR*EXPF((ALAM1(I)*T2(I))+(ALAM2(I)*
   1DCT3)+(ALAM3(I)*DCT4)+(ALAM4(I)*DCT5)))/(PNF(I)
   2*FMASS(I)*ABD(I)*0.01)
284 GO TO 290
285 DCT6=DECAY-T5(I)
286 DCT5=T5(I)-T4(I)
287 DCT4=T4(I)-T3(I)
288 DCT3=T3(I)-T2(I)
289 CPM=(CR*EXPF((ALAM1(I)*T2(I))+(ALAM2(I)*
   1DCT3)+(ALAM3(I)*DCT4)+(ALAM4(I)*DCT5)+
   2(ALAM5(I)*DCT6)))/(PNF(I)*FMASS(I)*ABD(I)*0.01)
290 DPS=CPM/(CEFY*0.6)
291 FLUX=(DPS*ATWT(I))/(0.6025*XSECT(I))
292 IF(NS)306,306,293
293 LI=LI+1
294 SUCPM=SUCPM+CPM
295 SUDPS=SUDPS+DPS
296 SUFLX=SUFLX+FLUX
297 STDU=STDU+(STD**2)
298 IF(CPM)299,299,300
299 KI=KI+1
300 IF(DPS)301,301,302
301 KJ=KJ+1
302 IF(FLUX)303,303,304
303 KL=KL+1
304 WRITE OUTPUT TAPE 6,1043,JCOU,JSHE,DECAY,BKGRB,
   1CR,STD,CPM,DPS,FLUX
305 GO TO 318
306 LJ=LJ+1
307 SNCPM=SNCPM+CPM
308 SNDPS=SNDPS+DPS
309 SNFLX=SNFLX+FLUX
310 STDN=STDN+(STD**2)
311 IF(CPM)312,312,313
312 MI=MI+1
313 IF(DPS)314,314,315
314 MJ=MJ+1
315 IF(FLUX)316,316,317
316 MK=MK+1
317 WRITE OUTPUT TAPE 6,1044,JCOU,JSHE,DECAY,BKGRB,
   1CR,STD,CPM,DPS,FLUX
318 CONTINUE
319 IF(LI)337,337,320
320 IJ=LI-KI                                                    CPM
321 AIJ=IJ                                                      CPM
322 IK=LI-KJ                                                    DPS
323 AIK=IK                                                      DPS
```

```
 324 IL=LI-KL                                                       FLUX
 325 AIL=IL                                                         FLUX
 326 ACPM=SUCPM/AIJ
 327 ADPS=SUDPS/AIK
 328 AFLUX=SUFLX/AIL
 329 PD=0.0
 330 DO 332 K=1,NP
 331 PD=PD+(EP(K)**2)
 332 CONTINUE
 333 A=STDU+PD+(PSTD**2)
 334 ASTDC=SQRTF(A)
 335 ASTDD=SQRTF(A+(UEFY**2))
 336 GO TO 342
 337 ACPM=0.0
 338 ASTDC=0.0
 339 ADPS=0.0
 340 ASTDD=0.0
 341 AFLUX=0.0
 342 IF(LJ)360,360,343
 343 JI=LJ-MI                                                       CPM
 344 BJI=JI                                                         CPM
 345 JK=LJ-MJ                                                       DPS
 346 BJK=JK                                                         DPS
 347 JL=LJ-MK                                                       FLUX
 348 BJL=JL                                                         FLUX
 349 BCPM=SNCPM/BJI
 350 BDPS=SNDPS/BJK
 351 BFLUX=SNFLX/BJL
 352 PD=0.0
 353 DO 355 K=1,NP
 354 PD=PD+(EP(K)**2)
 355 CONTINUE
 356 B=STDN+PD+(PSTD**2)
 357 BSTDC=SQRTF(B)
 358 BSTDD=SQRTF(B+(UEFY**2))
 359 GO TO 365
 360 BCPM=0.0
 361 BSTDC=0.0
 362 BDPS=0.0
 363 BSTDD=0.0
 364 BFLUX=0.0
 365 WRITE OUTPUT TAPE 6,1045                                         HEADINGA
 366 WRITE OUTPUT TAPE 6,1046,ACPM,ASTDC,ADPS,
    1ASTDD,AFLUX,ASTDD,BCPM,BSTDC,BDPS,BSTDD,
    2BFLUX,BSTDD
2366 IF(ACPM)3366,3366,4366
3366 WCPM=BCPM
     WDPS=BDPS
     WFLUX=BFLUX
     WSTDC=BSTDC
     WSTDD=BSTDD
     GO TO 372
4366 IF(BCPM)5366,5366,367
5366 WCPM=ACPM
     WDPS=ADPS
```

```
      WFLUX=AFLUX
      WSTDC=ASTDC
      WSTDD=ASTDD
      GO TO 372
  367 WCPM=(ACPM+BCPM)/2.0
  368 WDPS=(ADPS+BDPS)/2.0
  369 WFLUX=(AFLUX+BFLUX)/2.0
  370 WSTDC=SQRTF((ASTDC**2)+(BSTDC**2))
  371 WSTDD=SQRTF((ASTDD**2)+(BSTDD**2))
  372 WRITE OUTPUT TAPE 6,1047,WCPM,WSTDC,WDPS,
     1WSTDD,WFLUX,WSTDD
  373 GCPM(L)=WCPM
  374 GDPS(L)=WDPS
  375 FOLNO=NFL
 2375 IF(IAUTO) 3375,3375,3375
 3375 FLID(L)=(FDL*100.0)+FOLNO
 4375 GO TO 376
  376 CONTINUE
  377 READ INPUT TAPE 5,1002,NPOS
  378 IF(NPOS)411,411,379
  379 WRITE OUTPUT TAPE 6,1048,II                          SUMMARY
  380 DO 410 N=1,NPOS
  381 WRITE OUTPUT TAPE 6,1051,N                           POSITION
  382 READ INPUT TAPE 5,1001                               LOCATION
  383 WRITE OUTPUT TAPE 6,1001                             LOCATION
 2383 IF(IAUTO) 384,384,384
  384 READ INPUT TAPE 5,1049,(KF(NK),KG(NK),NK=1,10)
  385 READ INPUT TAPE 5,1050,(KD(NK),NK=1,10)
  386 WRITE OUTPUT TAPE 6,1052
  387 DO 409 NK=1,10                                       HEADINGS
  388 IF(KF(NK))409,409,3388
 3388 IF(IAUTO) 389,389,389
  389 HKF(NK)=KF(NK)
 2389 HKG(NK)=KG(NK)
 3389 SFID(NK)=(HKF(NK)*100.0)+HKG(NK)
  390 DO 392 L=1,NF
  391 IF(SFID(NK)-FLID(L))392,397,392
  392 CONTINUE
  393 HCPM(NK)=0.0
  394 HDPS(NK)=0.0
  395 L=0
  396 GO TO 407
  397 HCPM(NK)=GCPM(L)
  398 HDPS(NK)=GDPS(L)
  399 IF(KD(NK))407,407,400
  400 IF(KF(NK)-KF(NK-1))407,401,407
  401 SC=HCPM(NK-1)-HCPM(NK)
  402 SD=HDPS(NK-1)-HDPS(NK)
  403 IF(SC)404,404,408
  404 SC=0.0
  405 SD=0.0
  406 GO TO 408
  407 WRITE OUTPUT TAPE 6,1053,NK,SFID(NK),L,
     1HCPM(NK),HDPS(NK)
      GO TO 409
```

```
 408 WRITE OUTPUT TAPE 6,1054,NK,SFID(NK),L,
    1HCPM(NK),HDPS(NK),SC,SD
 409 CONTINUE
 410 CONTINUE
 411 II=II+1
2411 IF(NCON-II+1)412,412,34
1000 FORMAT(1H1,///////35X,46HNEUTRON ACTIVATION FOIL DATA REDUCTION PR
    1OGRAM,//////)
1001 FORMAT(72H
    1                    )
1002 FORMAT(I6)
1003 FORMAT(//////51X,17HSTORED INPUT DATA//
    1120H I   ATOMIC   FOIL    REACTION    FOIL        FOIL        FOIL         F
    2OIL       ISOTOPIC      DECAY       REACTION          SELF        /
    3120H      NUMBER  GROUP    NUMBER      MASS     DIAMETER  THICKNESS   MOL
    4ECULAR   ABUNDANCE   CONSTANT        X-SECTION     ABSORPTION     /
    5120H                                  (GRAMS)     (INCH)       (INCH)          W
    6EIGHT     (PERCENT)   (PER MIN)       (BARNS)         CONSTANT      ///)
1004 FORMAT(I3,I3,I2,F7.3,F6.3,F5.3,2F8.3,3E10.4)
1005 FORMAT(I6,E14.4,2E20.4)
1006 FORMAT(I3,3X,I2,5X,I2,6X,I1,6X,0PF6.3,3X,0PF6.3,5X,0PF6.3,5X,0PF7.
    13,4X,0F7.3,2X,1PE11.4,2X,1PE11.4,2X,1PE11.4)
1007 FORMAT(I3,I3,I2,5E10.4)
1008 FORMAT(I3,I3,I2,4F7.0)
1009 FORMAT(I8,2I7, 7X,1PE10.4,35H DECAY CONSTANT TO BE USED BETWEEN
    1,0PF8.0,12H MINUTES AND,0PF8.0,8H MINUTES)
1010 FORMAT(1H1,///////39X,40HREACTION NUMBER 1 = (N,GAMMA)    REACTION/
    139X,40HREACTION NUMBER 2 = (N,PROTON)  REACTION/39X,40HREACTION NU
    2MBER 3 = (N,ALPHA)    REACTION/39X,40HREACTION NUMBER 4 = (N,2N)
    3   REACTION/39X,40HREACTION NUMBER 5 = (N,FISSION) REACTION/39X,38
    4HREACTION NUMBER 6 = MULTIPLE REACTIONS////18X,80HJ    COUNTER   SHE
    5LF   ATOMIC   FOIL    REACTION  RESOLUTION  EFFICIENCY  EFFICIENCY/2
    62X,77HNUMBER     NUMBER  NUMBER   GROUP    NUMBER         TIME        FACT
    7OR     UNCERTAINTY/65X,33H(SECONDS)    (PERCENT)     (PERCENT)////)
1011 FORMAT(I3,I2,I3,I3,I2,E8.2,F8.3,F8.3)
1012 FORMAT(17X,I3,4X,I2,7X,I1,7X,I2,6X,I2,6X,I1,7X,1PE9.2,4X.0PF7.3,5X
    1,0PF7.3)
1013 FORMAT(1H1,///////33X,51HFOIL REDUCTION DATA ARE GIVEN AS SATURATE
    1D ACTIVITY/43X,34HCORRECTED TO REACTOR SHUTDOWN TIME/44X,31HFOR TH
    2E FOLLOWING CONFIGURATION///)
1014 FORMAT(///////48X,24HREACTOR POWER INPUT DATA/////18X,80HK      REA
    1CTOR POWER      POWER UNCERTAINTY      TIME AT POWER      INTEGRATED
    2POWER/27X,69H(WATTS)                   (PERCENT)               (MINUTES)
    3      (WATT-HOURS)///)
1015 FORMAT(F14.2,F7.2,F7.0)
1016 FORMAT(17X,I2,5X,0PF13.2,11X,0PF5.2,14X,0PF7.2,10X,1PE11.4)
1017 FORMAT(I3,     I2,I3,I3,I5,I3,I2,F7.0,I5,I2,I6)
1018 FORMAT(77X,7HTOTAL =,1PE11.4///////)
1019 FORMAT(6X,21HREACTOR SHUTDOWN TIME,F9.0,46H MINUTES FROM 0000 HOUR
    1 JANUARY 1            DATE,I4,I4,I6,9H    TIME   2I2)
1020 FORMAT(1H1,///////47X,24HPOWER SATURATION FACTORS/////30X,60HI
    1      FOIL INDEX            POWER SATURATION FACTORS (WATTS)///)
1021 FORMAT(29X,I2,10X,0PF6.0,19X,1PE11.4)
1022 FORMAT(I3,I2,I2,I2,I3,I3,I2,I2)
1023 FORMAT(1H1,////////44X,31HDATA REDUCTION FOR FOIL NUMBER ,I3,I2,I2)
```

```
1024 FORMAT(//16X,79HERROR - NO REACTION INDICATED ON DATA SHEET - DATA
    1 REDUCTION ASSUMES FOIL INDEX,0PF9.0,//)
1025 FORMAT(//28X,18HERROR - FOIL INDEX,0PF9.0,37H  NOT LISTED IN TABLE
    1 OF STORED INPUT,//)
1026 FORMAT(44X,33H(N,GAMMA) REACTION - SIMPLE DECAY,///)
1027 FORMAT(43X,35H(N,GAMMA) REACTION - MULTIPLE DECAY,///)
1028 FORMAT(43X,34H(N,PROTON) REACTION - SIMPLE DECAY,///)
1029 FORMAT(42X,36H(N,PROTON) REACTION - MULTIPLE DECAY,///)
1030 FORMAT(44X,33H(N,ALPHA) REACTION - SIMPLE DECAY,///)
1031 FORMAT(43X,35H(N,ALPHA) REACTION - MULTIPLE DECAY,///)
1032 FORMAT(45X,30H(N,2N) REACTION - SIMPLE DECAY,///)
1033 FORMAT(44X,32H(N,2N) REACTION - MULTIPLE DECAY,///)
1034 FORMAT(43X,35H(N,FISSION) REACTION - SIMPLE DECAY,///)
1035 FORMAT(42X,37H(N,FISSION) REACTION - MULTIPLE DECAY,///)
1036 FORMAT(51X,18HMULTIPLE REACTIONS,///)
1037 FORMAT(//26X,21HERROR - COUNTER INDEX,0PF10.0,37H  NOT LISTED IN T
    1ABLE OF STORED INPUT,//)
1038 FORMAT(I2,I3,I3,I5,I3,I2,F7.0,I3,I2,F6.0,F3.0,F6.2,F7.0,I2)
1039 FORMAT(////45X,28HPREIRRADIATION COUNTING DATA///8X,98HCOUNTER/SHE
    1LF  TIME AT COUNTING   TIME PRIOR TO REACTOR   BACKGROUND COUNT R
    2ATE          COUNT RATE/11X,96HNUMBER        (MIN FROM 0000)       SHUT
    3DOWN TIME (MIN)          (COUNTS/MIN)                (COUNTS/MIN)///)
1040 FORMAT(11X,I2,3X,I1,9X,0PF7.0,16X,0PF7.0,12X,0PF8.2,3H * ,0PF4.1,4
    1H 0/0,4X,0PF9.3,3H * ,0PF4.1,4H 0/0)
1041 FORMAT(////53X,13HCOUNTING DATA///120H COUNTER   DECAY TIME   BACKG
    1ROUND  COUNT RATE   STD DEV   SATURATED ACTIVITY   SATURATED ACTIV
    2ITY   EFFECTIVE FLUX       /120H  SHELF    (MINUTES)   (CTS/MIN)
    3(CTS/MIN)    (PERCENT)  (CTS/MIN-GM(ISO)-W)  (DIS/SEC-GM(ISO)-W)  (
    4N/SQ CM-SEC-W)       ///)
1042 FORMAT(I8,2I7, 7X,1PE10.4,48H DECAY CONSTANT TO BE USED FOR TIME G
    1REATER THAN,7X,0PF8.0,8H MINUTES)
1043 FORMAT(3H US,2X,I2,I2,4X,0PF6.0,4X,0PF8.2,5X,0PF9.2,3X,0PF6.2,7X,1
    1PE11.4,10X,1PE11.4,9X,1PE11.4)
1044 FORMAT(3H NS,2X,I2,I2,4X,0PF6.0,4X,0PF8.2,5X,0PF9.2,3X,0PF6.2,7X,1
    1PE11.4,10X,1PE11.4,9X,1PE11.4)
1045 FORMAT(///21X61HAVERAGE SATURATED ACTIVITY           AVERAGE SATURAT
    1ED ACTIVITY,14X12HAVERAGE FLUX,/19X, 96H(COUNTS/MIN-GM(ISOTOPE)-WA
    2TT)  (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)  (NEUTRONS/SQ CM-SEC-W
    3ATT),//)
1046 FORMAT(22H  UNNUMBERED SIDE (US),1PE12.4,2H *,0PF7.2,4H 0/0,1PE24.
    14,2H *,0PF7.2,4H 0/0,1PE17.4,2H *,0PF7.2,4H 0/0,/20H  NUMBERED SID
    2E (NS),1PE14.4,2H *,0PF7.2,4H 0/0,1PE24.4,2H *,0PF7.2,4H 0/0,1PE17
    3.4,2H *,0PF7.2,4H 0/0)
1047 FORMAT(18H  AVERAGE OF SIDES,1PE16.4,2H *,0PF7.2,4H 0/0,1PE24.4,2H
    1 *,0PF7.2,4H 0/0,1PE17.4,2H *,0PF7.2,4H 0/0)
1048 FORMAT(1H1,41X,13HCONFIGURATION,I5,14H  DATA SUMMARY,//)
1049 FORMAT(10(I5,I2))
1050 FORMAT(I4,9(I7))
1051 FORMAT(///49X8HPOSITION,I5,///)
1052 FORMAT(//71X,29HBARE FOIL MINUS FILTERED FOIL,/84H  N   FOIL     D
    1ATA      SATURATED ACTIVITY   SATURATED ACTIVITY   SATURATED ACTIVI
    2TY,21H    SATURATED ACTIVITY,/5X,100HNUMBER  LOCATION  (CTS/MIN-GM(
    3ISO)-W)  (DIS/SEC-GM(ISO)-W)  (CTS/MIN-GM(ISO)-W)  (DIS/SEC-GM(ISO
    4)-W),///)
1053 FORMAT(I3,F8.0,I7,1PE20.4,1PE21.4)
```

```
1054 FORMAT(I3,F8.0,I7,1PE20.4,1PE21.4,1PE20.4,1PE21.4)
1055 FORMAT(I3,I4,I3,I2,0PF8.0,0PF8.0,0PF8.2,I6,I2)
1058 FORMAT(//22X,35HERROR - SECOND INPUT CARD FOR COUNT,I3,35H  NOT BA
    1CKGROUND DATA - FOIL NUMBER,I2,I4,//)
1059 FORMAT(//33X,45HERROR - BACKGROUND TAKEN ON DIFFERENT COUNTER,//)
 412 CONTINUE
     CALL EXIT
     END
```

The descriptive statements, such as identification of the author, facility, foil location, etc., may use any combination of letters, numbers, or standard IBM symbols in columns 2 through 72.

Under no circumstance should any number, letter or symbol be entered in column 1 of any card since column 1 controls the operation of the system tape.

The sample problem input data sheets were devised for the most general applications; if the program is to be used for more specific applications, data sheets may be simplified by eliminating space for entry of unwanted data. For example, if one always records time from the end of the foil exposure, the input data sheets need not show columns for entry of the month, day, year, and military time; they might have, instead, an indication to the key punch operators to skip to a specified column for the elapsed time entry. Furthermore, format statements may be changed to eliminate unwanted input data or to reorganize the input quantities if this facilitates utilization of the program.

Standard Data Input

Input Data Sheet Number 1

Card No. 1	Name
Card No. 2	Facility
Card No. 3	Test Identification

(Any combination of letters, numbers, or standard symbols may be used)

Input Data Sheet Number 2

Card No. 1	Number ($\leq$ 99) of foil types (columns 5-6)
Card No. 2	Foil physical and nuclear data for simple decay

Columns

2-3	Each elemental foil is identified by the atomic number of the foil material. (Compounds and mixtures require a special numerical notation which is at the discretion of the user.)
5-6	Each type foil may be categorized into 99 or fewer groups to permit classification by mass, diameter, thickness, purity, etc. Each of the 99 groups may contain up to 99 foils (up to 9801 foils of each material).
8	Since a given type foil may be used for more than one neutron induced reaction, and since the decay characteristics of the resultant unstable isotope are unique for a given reaction, the foil identification includes a reaction index between 1 and 5 as follows:

Reaction index = 1 for (n, γ) reactions
= 2 for (n, p) reactions
= 3 for (n, α) reactions
= 4 for $(n, 2n)$ reactions
= 5 for (n, fission) reactions

10-15	Foil mass in grams
17-21	Foil diameter in inches
23-26	Foil thickness in inches
28-34	Atomic weight for elemental foils; molecular weight for compounds and mixtures
36-42	Abundance (weight percent) of target isotope in foil material
44-52	Decay constant for unstable isotope produced by the specified reaction expressed in units of reciprocal minutes
54-62	Effective reaction cross section expressed in barns

Column

64-72 Self-absorption constant (self-absorption coefficient times the foil "thickness" in compatible units) for compensation of finite thickness foils

Input Data Sheet Number 3

Since complex decay schemes are sometimes encountered (notably for fission foils), a provision has been made for inclusion of five decay constants each to be used during a particular portion of the decay.

Card No. 1 Foil physical and nuclear data for multiple decay

Card 1 is filled out the same as was Card 2 on Sheet 2 with the specification of a reaction number 1 through 6 and the omission of item 9 (columns 44-52). The omission of item 9 and the subsequent inclusion of cards 2 and 3 automatically define a multiple decay which will be indicated on the data output. Reaction number 6 is used for multiple reactions.

Card No. 2 Decay constants for specific time intervals

The complex decay scheme is to be approximated by five or less simple decay constants; if fewer than five constants are used, the last constant should be entered in the remaining decay constant positions.

Card No. 3 Upper time limits for decay intervals

The time entries (minutes) are the upper limits of the decay intervals assuming an initial point of zero time. The fourth time entry is also understood by the program to be the lower limit of the fifth decay interval.

Input Data Sheet Number 4

Card No. 1	Number ($\leq$ 500) of counter constant cards (columns 4-6)
Card No. 2	Counter constant data

Column	
2-3	Each counter is to be identified by a number between 1 and 99.
5	Since some counters are provided with several shelves or foil-counter geometries, the second entry defines the counting geometry or technique.
7-8	Rather than consuming machine storage with double indexing, the foil identification is included as part of the counter index. The third entry is the atomic number of the foil.
10-11	Foil group number. If the efficiency factor is to be used for all foil groups, leave this entry blank.
13	Reaction number

Reaction index = 1 for (n, γ) reactions
= 2 for (n, p) reactions
= 3 for (n, α) reactions
= 4 for (n, 2n) reactions
= 5 for (n, f) reactions
= 6 for multiple reactions

15-21	Counter resolving time in seconds
23-29	Counter efficiency factor for the specific type foil and reaction (percentage - number of recorded counts per disintegration)
32-37	Percent uncertainty in the counter efficiency factor

Repeat Card No. 2 procedure as many times as indicated on Card No. 1.

Input Data Sheet Number 5

Card No. 1	Number of configurations or reactor runs for which data are to be reduced (columns 4-6)
Card No. 2	Configuration identification
Card No. 3	Configuration data

Column	
2-3	Number ($\leq$ 10) of power levels used during reactor run (If long periods are used and it is desired to include the activation during the power buildup, the buildup should be approximated as a step function.)
5	Constant code number (1)
7-21	As a means of determining the length of time between the end of irradiation and counting time, all times are converted to minutes from 0000 hour January 1st. If a digital clock is available to record the elapsed time since 0000 hour January 1st, the actual time in minutes may be recorded in columns 23-28; if, however, no clock of this nature is available, the calendar date (month, day, and year) and military time are to be entered in columns 7 through 21. The program has a built-in calendar for converting calendar dates to the elapsed time, accounting for leap years and differences in years should the test period extend over December 31. If digital clocks are used for recording the elapsed time between the end of irradiation and counting time, <u>no</u> entry should be made in columns 7 through 28.
23-28	Elapsed time (minutes) from 0000 hours January 1st.
30-33	Number ($\leq$ 9999) of foils to be reduced for given configuration or reactor run.
35	To be used only with automatic data readout systems (see Appendix II).

Card No. 4 Reactor run data

Column	
2-14	Reactor power (watts).
16-21	Percent uncertainty in reactor power level.
23-28	Duration (minutes) at power level.
	Repeat Card No. 4 procedure as many times as indicated on Card No. 3, Item No. 1.

Input Data Sheet Number 6

Card No. 1 Foil counting data

Column	
2-7	Foil identification number. The six digit foil identification number is interpreted as follows: the first two digits are the atomic number of the foil material; the second two digits indicate the foil group; and third set of two digits is the foil number in the given group.
9	Reaction number corresponding to isotopic decay to be measured.
11-12	Number ($\leqslant 99$) of times the foil was counted and data recorded.
14-15	Counter number if used for all counts.
17	Shelf number or counting geometry index if used for all counts.
19	Indicate whether or not the foil was counted prior to irradiation. If no pre-irradiation count was taken, leave this entry blank. If a pre-irradiation count was taken, enter a 1 and fill out "pre-irradiation data".

Card No. 2 Foil location
Card No. 3 Comment Card
Card No. 4 Pre-irradiation count data

Column	
2	Constant code number (2).
4-18	Time at start of pre-irradiation count, calendar date and military time if no entry is made in columns 20-25.
20-25	Elapsed time (minutes) from 0000 hour January 1st.
27-28	Counter number - if entries 4 and 5 of Card No. 1 are filled in, these data need not be supplied; if, however, data are provided both here and on Card No. 1 and if the data differ, the input here will take precedence.
30	Shelf number or counting geometry index.
32-36	Total number of background counts.
38-39	Background count duration (minutes).
41-45	Pre-irradiation count duration (minutes).
47-52	Pre-irradiation total counts.

Card No. 5 Counting Data

Column	
2	Constant code number (3).
4-18	Calendar date and military time if no entry is to be made in columns 20-25.
20-25	Elapsed time (minutes) from 0000 hour January 1st. If time is recorded from reactor shutdown time, enter decay time (minutes) and check to make certain that no date or time was entered on Sheet No. 5, Card No. 3.

Column

Column	
27-28	Counter number - If entries 4 and 5 of Card No. 1 are filled in, these data need not be supplied; if, however, data are provided both here and on Card No. 1 and if the data differ, the input supplied here will take precedence.
30	Shelf number or counting geometry index.
32-36	Total number of background counts.
38-39	Background count duration (minutes).
41-45	Count duration (minutes).
47-52	Total number of counts.
54	Side of foil which was counted. If numbered side of foil was counted, leave entry blank; if, however, the unnumbered side of the foil was counted, enter a 1.

Repeat Card No. 5 procedure as many times as indicated on Card No. 1, Item No. 3.

Input Data Sheet Number 7

Card No. 1	Number of data locations in given configuration. If no data summary is desired,leave this card blank and omit the remaining cards on the data sheet (columns 4-6).
Card No. 2	Data location description.
Card No. 3	Foil numbers (six digit numbers) of foils associated with given data position.
Card No. 4	Indication of "filtered" (i.e., cadmium covered, etc.) foil. If foil is covered with a neutron filter, such as cadmium and if it is desired that the difference between the foil listed in the preceding column and the given column be determined,enter a 1, otherwise leave entry blank.

Repeat procedure for Cards 2, 3, and 4 as many times as indicated on Card No. 1.

PROGRAM INPUT LIMITATIONS

The following lists give the input data limitations for the various quantities used in the program as dictated by the program memory capacity.

Quantity	Limiting Number
Number of foil types for foil constants	99
Number of multiple decay foil types	50
Number of counters for counter constants	500
Number of reactor power levels	10
Number of foils for any one grouping in the data summary	10
Number of foils per configuration if data summary is used	1000
Number of foils per configuration without summary	32,000
Number of counts per foil	999
Number of configurations	32,000

Quantity	Limiting Value
Reactor power (watts)	$10^{-2} < p_i < 10^9$
Duration at given power level (minutes)	$10^{-1} < t_i < 10^5$
Foil mass (grams)	$10^{-3} < M_f < 10^3$
Background (total counts)	$< 10^6$
Foil Count (total counts)	$< 10^7$
Duration of background count (minutes)	$.1 < t_B < 10^3$
Duration of foil count (minutes)	$10^{-1} < t_C < 10^4$

PROGRAM DECK SETUP

The following outline shows the proper arrangement of the binary deck and input data cards for running the foil data reduction program.

1. Binary deck and system tape instruction cards, if any.

2. Identification information (Data Sheet No. 1).

3. Foil physical and nuclear data (Data Sheet Nos. 2 and 3).

4. Counter data (Data Sheet No. 4).

5. Configuration and power data for first configuration (Data Sheet No. 5).

6. Counting data for all foils in first configuration (Data Sheet No. 6).

7. Data summary information for first configuration (Data Sheet No. 7).

8. Configuration and power data for second configuration (Data Sheet No. 5).

9. Counting data for all foils in second configuration (Data Sheet No. 6).

10. Data summary information for second configuration (Data Sheet No. 7).

ERROR RETURNS

The error returns which are printed out by the program are listed here along with a discussion of the data errors which would result in the error return.

"ERROR - NO REACTION INDICATED ON DATA SHEET -
DATA REDUCTION ASSUMES FOIL INDEX. . . XXXXX"

The foil index generated by the program is a five-digit number, AAGGR, where AA is the atomic number of the target element, GG is the group number, and R is the reaction index. All of the foil constant input data are stored as a function of the foil index; to use the constant data in the data reduction, the program must search all of the foil constant indices until one of the indices is matched to the foil index of the data being analyzed. If the reaction index were not indicated on the foil counting data sheet (Data Sheet No. 6), the foil index search would be fruitless. Assuming that, in general, only one reaction would be of interest for a particular foil, the program will reinitiate the foil index search, increasing the value of the reaction index by one, until a successful index match is made or until the value of the reaction index reaches six (6). Thus, if after one or more iterations a foil index match is made, the program will print out the above error return and continue with the data reduction; if, on the other hand, the reaction index is raised successively through all permissible values and the search is still fruitless, the following error return is printed out and the program continues with the next foil.

"ERROR - FOIL INDEX XXXXX NOT LISTED IN TABLE OF STORED INPUT"

In addition to the situation discussed above, this error return will be printed out if a reaction index is indicated on the foil counting sheet but no corresponding foil data are included in the foil constant input data.

"ERROR - COUNTER INDEX XXXXXXXX NOT LISTED IN TABLE OF STORED INPUT"

Similar to the foil constant data, the counter constant data are made available for use by searching counter indices. The counter indices generated by the program are seven- or eight-digit numbers, CCS AA GGR, where CC is the counter number, S is the shelf or counting geometry index, AA is the atomic number of the target element, GG is the group number, and R is the reaction index. If the counter index, generated from data supplied on the foil counting sheet, can not be matched with an index in the counter constant data, the above error return will be printed out. In the event that the above error occurs, the data reduction will continue and the saturated activity will be given only in units of counts per minute-gram (target isotope) - watt. It should be noted, however, that no corrections for resolution losses can be included in the answer.

APPENDIX I

SAMPLE PROBLEM

For the sample problem, examine the case where the data from 22 foils irradiated under three different conditions are to be reduced. Further, let the data represent seven types of foils:

Foil	Reaction	Atomic Number	Number of Foils
Magnesium	$Mg^{24}(n, p)Na^{24}$	12	1
Aluminum	$Al^{27}(n, \alpha)Na^{24}$	13	5
Phosphorus	$P^{31}(n, \gamma)P^{32}$	15	1
Sulfur	$S^{32}(n, p)P^{32}$	16	1
Manganese	$Mn^{55}(n, \gamma)Mn^{56}$	25	3
Copper	$Cu^{63}(n, \gamma)Cu^{64}$	29	10
Uranium	U^{238}(n, fission)	92	1

The physical and nuclear parameters for six of these foils are listed on the second and third sheets of the input data. The data for phosphorus were intentionally omitted to demonstrate one of the error returns. The data for gold foils (atomic number 79) are included to demonstrate that the list of data need not be restricted to those foils for which counting data are being reduced. The multiple decay constants for the uranium foils were determined from plots of typical foil decays as shown in FIG 1. The cadmium-covered aluminum multiple decay constants were obtained from a knowledge of the two competing fast neutron reactions in Al^{27}:

$Al^{27}(n, p)Mg^{27}$, 9.5 minute half-life,

$Al^{27}(n, \alpha)Na^{24}$, 15 hour half-life.

Since the initial activation due to the two aluminum reactions is proportional to the ratio of the spectrum-averaged cross sections, which were assumed to be 4.3 millibarns and 0.6 millibarns, respectively, the decay constants may be determined from the composite decay rates as shown in FIG 2.

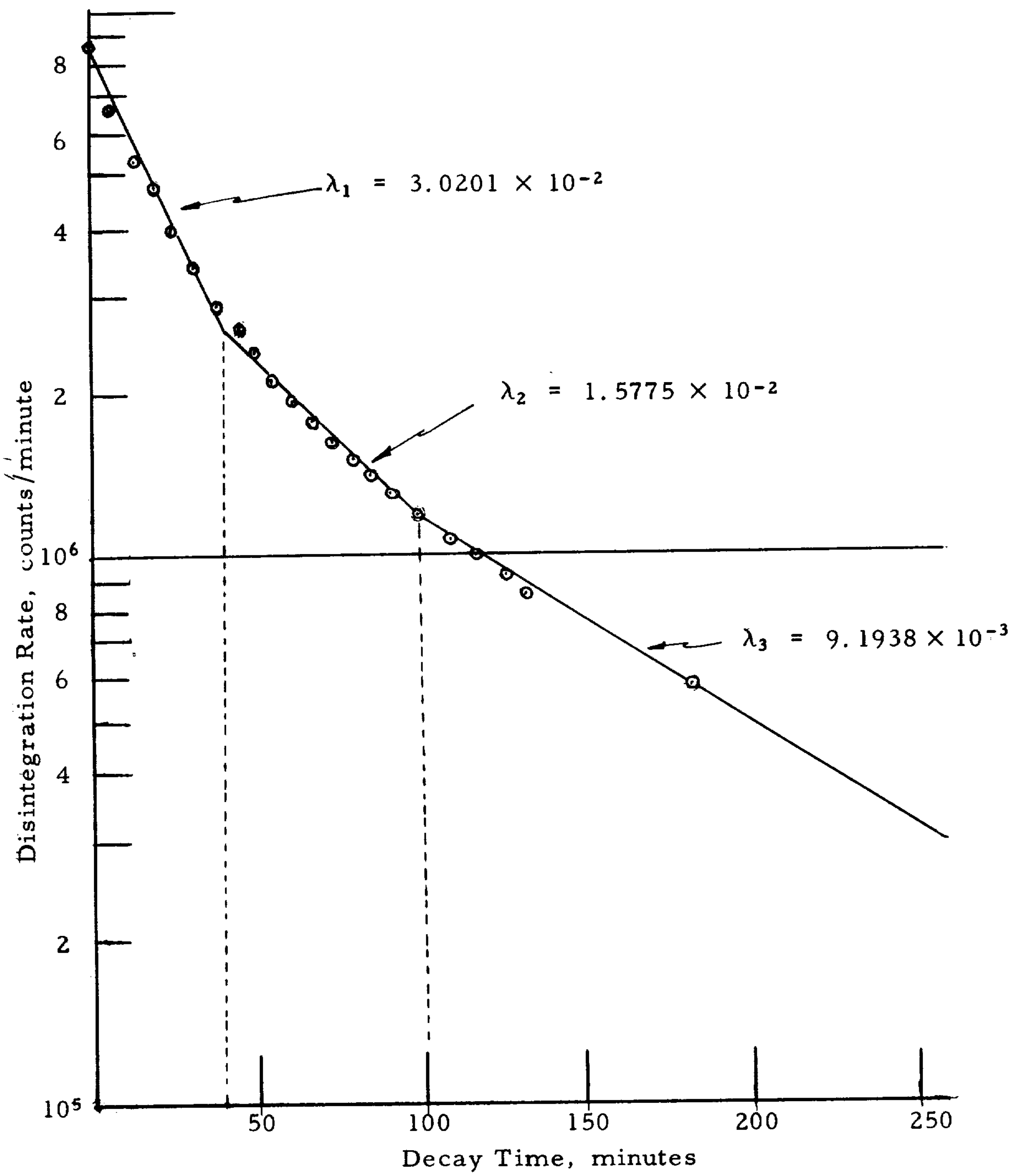

FIGURE 1. U^{238} FOIL DISINTEGRATION RATE AS A FUNCTION OF TIME

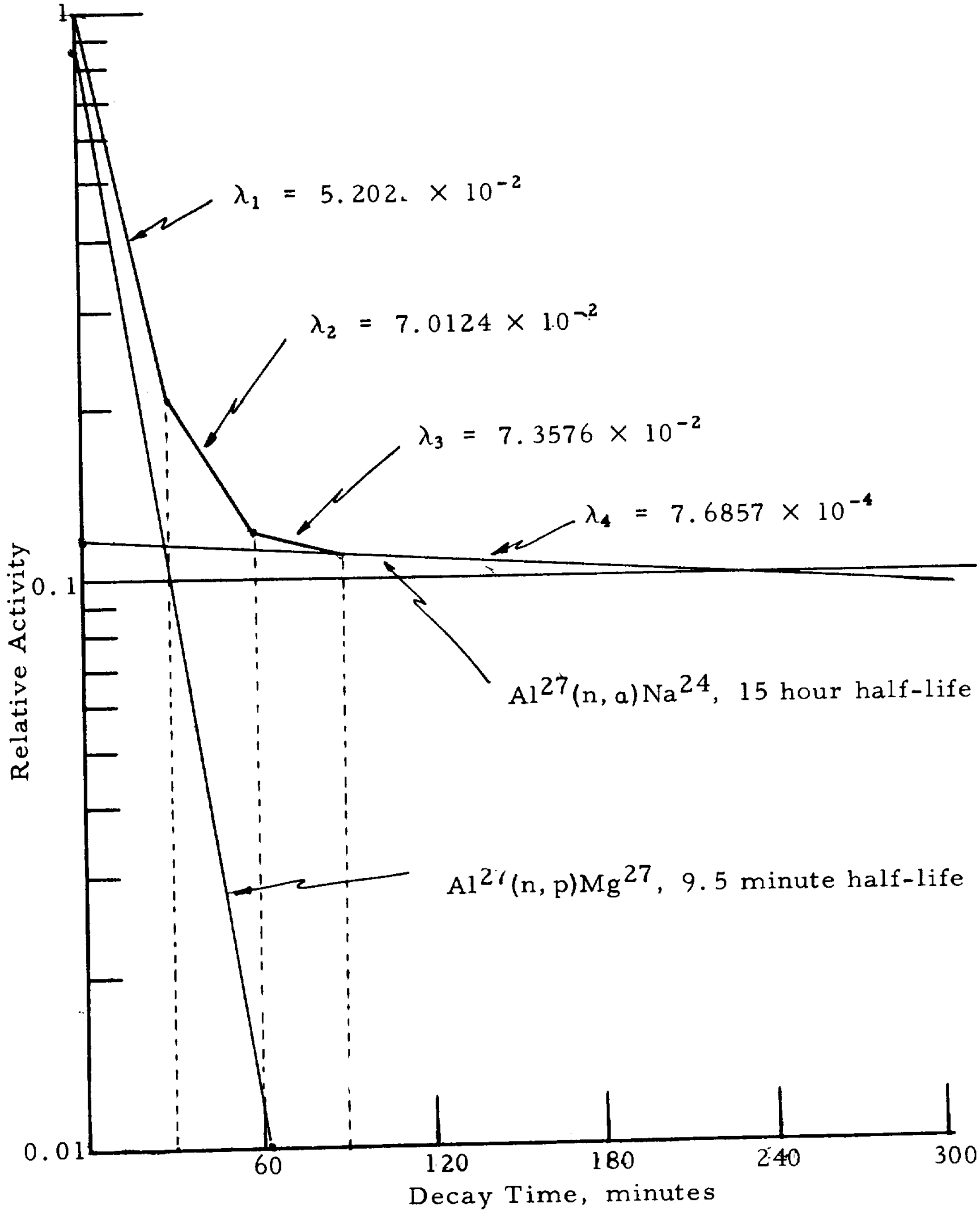

FIGURE 2. ALUMINUM (n, p) AND (n, α) DISINTEGRATION RATE AS A FUNCTION OF TIME

The counter data for the various foils, with the exception of the uranium foils, are given on the fourth and fifth input data sheets. The counter data for the uranium foil were omitted to demonstrate an error return. It will be noted that the foil group constant for counter data card number 5, (CTR-C-5), is zero since these data are to be used for all three groups of aluminum (n, α) foils.

The three configurations or irradiation conditions were selected to demonstrate all three methods of recording the time at completion of irradiation. The first configuration data use calendar date and military time; the second configuration data use direct determination of the decay time; and the third configuration data use elapsed time from the beginning of the year.

The input data for this sample problem exemplify nearly all the practical situations which might arise during utilization of the program. Special attention should be directed to the following foil-counting data sheets:

1. On the data sheet for foil number 250168 of configuration 39A (first configuration), the counter number has been indicated for each count even though the same counter was used for all six counts. Although this is permissible, some machine search time would be saved if the counter number were indicated on card 250168A. The time saving becomes significant only if the number of counter constant cards is large and if the foil is counted many times.

2. For foil number 130199 of configuration 39A, counting data are provided for both sides of the foil.

3. For foil number 290102 of configuration SSR-VI-C (second configuration), counter number 18 is specified on card 290102A. Examination of the counter-constant data reveals that no data are given for counter 18 so that the error return, "ERROR-COUNTER INDEX 18129011 NOT LISTED IN TABLE OF STORED INPUT," will be printed out. The indication of counter 13 on card 290102E, however, will supersede the data given on card 290102A and the data reduction will continue.

4. Foil counting data are supplied for foil number 150101 of configuration SSR-VI-C. Foil constant data for this foil are not provided on the second and third data sheets; therefore, the error

return, "ERROR-FOIL INDEX 15014 NOT LISTED IN TABLE OF STORED INPUT," will be printed along with a listing of the input data for this foil and the program will proceed to the next foil.

5. The reaction index (R) for foil number 290101 of configuration SSR-VI-C has been omitted from card 290101A. Since the program will search for foil data for index 29010 which is not in the table of foil constants, the value of R will be increased until a matching index is found in the table, which, in this case, will be 29011. The error return, "ERROR-NO REACTION INDICATED ON DATA SHEET - DATA REDUCTION ASSUMES FOIL INDEX 29011," will be printed and the program will continue with the data reduction.

6. Foil 130114 of configuration USS-VAL (third configuration) is a combined decay of the aluminum (n, p) and (n, α) reactions as discussed earlier.

7. The uranium foil data, foil number 920858 of configuration USS-VAL, indicates counter number 2 on card 920858A; since no uranium foil data are given for this counter, the error return, "ERROR-COUNTER INDEX 2192085 NOT LISTED IN TABLE OF STORED INPUT" will be printed out. Also, data are included for a pre-irradiation count (P= 1 on card 920858A and card 920858D). Because no counter data are available, answers will be given in units of counts per minute-gram (target isotope) - watt only.

Various aspects of the data summary option are demonstrated for the three configurations. If the foil data are reduced in a random order as for configuration 39A (first configuration) and it is desired that the results be listed according to foil location as shown on the summary sheet, the program will automatically organize the data. The data summary for configuration SSR-VI-C (second configuration) demonstrates the method of obtaining sub-cadmium activity data for the copper foils included in the data reduction. In the first instance (card C SSR 1A), the activity of foil number 290111 will be subtracted from the activity of foil number 290101. For the second set of data on this card, however, the cadmium-covered foil activity is greater than the bare foil activity so that the subtraction will result in a negative number; the program will indicate the difference as zero, however. The program will automatically discern that the last two foils listed on card (C SSR 1A) are different elements so that no subtraction will be made even though the program is instructed to do

so on card (C SSR 1C). On card (C SSR 2B), foil number 170000 is included in the summary data; since foil number 170000 was not included in the counting data, zeros will be indicated in the summary data output for all quantities.

The sample problem, consisting of data from 22 foils and 3 configurations, required less than two minutes of IBM-7090 machine time.

FOIL DATA REDUCTION PROGRAM

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Column
1

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(1) Facility/Lab. (5) MARSHALLØSPACEØFLIGHTØCENTER

(1) Test (5) SAMPLEØPROBLEMØFORØFOILØDATAØREDUCTIONØPROGRAM

FOIL CONSTANTS (Simple Decay)

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Number of foil constant cards (use only once): 11

Foil At. No.	Foil Group	R	Foil Mass (gm)	Foil diam. (in.)	Foil Thick. (in.)	Foil mole wt.	Target isotope abundance (Wt. %)	Decay Constant (min^{-1}) ±	Reaction cross Section (barns) ±	Self absorb. constant ±	CØNSTANT
29	07	1	.788	.750	.017	63.540	69.000	9.0176-04	.	.	FØIL C 1
79	01	1	.100	.394	.002	197.000	100.000	1.7824-04	.	.	FØIL C 2
12	01	2	.329	.750	.062	24.320	78.800	7.6857-04	4.8000-02	.	FØIL C 3
13	01	3	.577	.750	.030	26.980	100.000	7.6857-04	1.1000-01	.	FØIL C 4
25	01	1	.007	.394	.002	54.940	100.000	4.4774-03	.	.	FØIL C 5
16	02	2	2.850	.750	.250	32.066	95.000	3.3541-05	3.0000-01	5.0000-01	FØIL C 6
13	02	3	.577	.750	.030	26.980	100.000	7.6857-04	1.1000-01	.	FØIL C 7
13	03	3	.577	.750	.030	26.980	100.000	7.6857-04	1.1000-01	.	FØIL C 8
29	01	1	8.037	.750	.125	63.540	69.000	9.0176-04	.	.	FØIL C 9
			.	.	.	.	.	.	.	.	FØIL C 0
			.	.	.	.	.	.	.	.	FØIL C 1
			.	.	.	.	.	.	.	.	FØIL C 2
			.	.	.	.	.	.	.	.	FØIL C 3
			.	.	.	.	.	.	.	.	FØIL C 4
			.	.	.	.	.	.	.	.	FØIL C 5
			.	.	.	.	.	.	.	.	FØIL C 6
			.	.	.	.	.	.	.	.	FØIL C 7
			.	.	.	.	.	.	.	.	FØIL C 8
			.	.	.	.	.	.	.	.	FØIL C 9
			.	.	.	.	.	.	.	.	FØIL C 0

FOIL CONSTANTS (Multiple Decay)

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil At. No.	Foil Group	R	Foil Mass (gm.)	Foil Diameter (in.)	Foil Thick. (in.)	Foil Molecular Wt.	Target isotope abundance (Wt. %)	Reaction σ (barns)	Self absorb. constant	Cols. 73–80
13	01	6	.577	.750	.030	26.980	100.000	1.1000-01	.	FØIL C10

At. No.	Group	R	λ_1 (min^{-1})	λ_2	λ_3	λ_4	λ_5	Cols. 73–80
13	01	6	5.2022-02	7.0124-02	7.3576-02	7.6857-04	7.6857-04	FØIL C10

At. No	Group	R	t_2 (min.)	t_3	t_4	t_5	Cols. 73–80
13	01	6	30	60	90	90	FØIL C10

Foil At. No.	Foil Group	R	Foil Mass (gm.)	Foil Diameter (in.)	Foil Thick. (in.)	Foil Molecular Wt.	Target isotope abundance (Wt. %)	Reaction σ (barns)	Self absorb. constant	Cols. 73–80
92	08	5	4.824	.750	.025	238.125	100.000	5.4000-01	.	FØIL C11

At. No.	Group	R	λ_1 (min^{-1})	λ_2	λ_3	λ_4	λ_5	Cols. 73–80
92	08	5	3.0202-02	1.5775-02	9.1938-03	2.1239-03	7.3334-04	FØIL C11

At. No	Group	R	t_2 (min.)	t_3	t_4	t_5	Cols. 73–80
92	08	5	40	100	275	650	FØIL C11

Foil At. No.	Foil Group	R	Foil Mass (gm.)	Foil Diameter (in.)	Foil Thick. (in.)	Foil Molecular Wt.	Target isotope abundance (Wt. %)	Reaction σ (barns)	Self absorb. constant	Cols. 73–80
		6	.	.	.	.	.	.	.	FØIL C

At. No.	Group	R	λ_1 (min^{-1})	λ_2	λ_3	λ_4	λ_5	Cols. 73–80
		6	.	.	.	.	.	FØIL C

At. No.	Group	R	t_2 (min.)	t_3	t_4	t_5	Cols. 73–80
		6					FØIL C

COUNTER CONSTANTS

Number of Counters (use only once)

Number of Counters	Cols. 73–80
13	NØ. CTRS

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Ctr. No.	Shelf	At. No.	Group	R	Resolution Time (sec.) ±	% Ct. Efficiency (counts/dis)	Eff. Uncertainty (%)	Cols. 73–80
31	1	29	07	1	2.04-04	.455	10.	CTR C 1
32	1	29	07	1	1.92-04	.452	10.	CTR C 2
33	1	29	07	1	2.88-04	.553	10.	CTR C 3
37	1	29	07	1	1.80-04	.490	10.	CTR C 4
4	1	13	00	3	2.80-05	4.100	10.	CTR C 5
41	1	12	01	2	8.70-07	56.300	10.	CTR C 6
32	1	25	01	1	1.92-04	6.500	10.	CTR C 7
33	1	25	01	1	2.88-04	6.670	10.	CTR C 8
36	1	25	01	1	1.97-04	6.610	10.	CTR C 9
5	1	13	01	6	2.80-05	4.330	10.	CTR C 10

COUNTER CONSTANTS

Number of Counters (use only once) — NØ. CTRS

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Ctr. No.	Shelf	At. No.	Group	R	Resolution Time (sec.) ±	% Ct. Efficiency (counts/dis)	Eff. Uncertainty (%)	Cols. 73–80
13	1	29	01	1	.	15.494	20.	CTR C 11
14	1	29	01	1	.	13.894	20.	CTR C 12
11	1	16	02	2	.	8.629	20.	CTR C 13
					.	.	.	CTR C 4
					.	.	.	CTR C 5
					.	.	.	CTR C 6
					.	.	.	CTR C 7
					.	.	.	CTR C 8
					.	.	.	CTR C 9
					.	.	.	CTR C 0

CONFIGURATION DATA

Columns: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 73 74 75 76 77 78 79 80

Number of Configurations or Reactor Runs (use only once)

2 — NØ. RUNS

CØNFIGURATION OTT 39A — C 39A 1

No. of Power Levels		Month	Day	Year	Mil. Time	Time from 0000 (min)	No. of Foils	Auto CE	Reactor Run No.	
4	1	4	9	1958	1935		10			SDT C 39A

Fill out a card for each Power Level

Actual Power Level (Watts)	% Power uncertainty	Minutes at Power	
80.	10.	31.5	C 39A PL 1
1000.	5.	35.5	C 39A PL 2
20000.	5.	54.	C 39A PL 3
500000.	5.	180.	C 39A PL 4
.	.	.	C PL 5
.	.	.	C PL 6
.	.	.	C PL 7
.	.	.	C PL 8
.	.	.	C PL 9
.	.	.	C PL 0

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P	Foil Number	
29079	4 1	3	33		1	290794	A

FOIL LOCATION: FOIL CARD 1 OF CONFIGURATION 39A — 290794 — B

COUNTER TYPE: END WINDOW — BIAS — BIAS WIDTH — 290794 — C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2												D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3	4	11	1958	0959				16	1	3	38947	1	HF	290794	E
3	4	11	1958	1747				16	1	3	29371	1	JC	290794	F
3	4	12	1958	1015				17	1	5	18371	1	JS	290794	G
3															H
3															J
3															K
3															L
3															M
3															N
3															P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
290783	1	3	31	1			290783	A

FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A — 290783 — B

TYPE COUNTER END WINDOW BIAS BIAS WIDTH — 290783 — C

Pre-irradiation data (if P = 1)

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
											D

Fill out a card for each time counted

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
4	14	1958	0051				16	1	3.	10554	1	GP	290783	E
4	14	1958	0825				160	10	5.	11854	1	HIF	290783	F
4	14	1958	1606				14	1	7.	11104	1	TK	290783	G
									.					H
									.					J
									.					K
									.					L
									.					M
									.					N
									.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
290778	1	3	37		1		290778	A

FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A — 290778 B

COUNTER TYPE END WINDOW — BIAS — BIAS WIDTH — 290778 C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts		
2										.			D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3	4	14	1958	0113				17	1	3.	34287	1	DWK	290778	E
3	4	14	1958	0845				14	1	3.	23243	1	BJW	290778	F
3	4	14	1958	2242				14	1	3.	11012	1	WR	290778	G
3										.					H
3										.					J
3										.					K
3										.					L
3										.					M
3										.					N
3										.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
250177	1	6	33		1			
FØIL LØCATIØN	FOIL CARD 1 OF CONFIGURATION 39A						250177	A
TYPE CØUNTER	END WINDOW	BIAS		BIAS WIDTH			250177	B
							250177	C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2										.		D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3	4	11	1958	1128				16	1	3.	50133	1	HSF	250177	E
3	4	11	1958	1328				16	1	3.	46018	1	HSF	250177	F
3	4	11	1958	1528				16	1	3.	43988	1	HSF	250177	G
3	4	11	1958	1830				16	1	3.	41382	1	DP	250177	H
3	4	11	1958	2032				16	1	3.	40839	1	DP	250177	J
3	4	11	1958	2258				16	1	3.	40080	1	WR	250177	K
3										.					L
3										.					M
3										.					N
3										.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
250175	1	6	32	1			250175	A

FØIL LØCATIØN FØIL CARD 2 ØF CØNFIGURATIØN 39A — 250175 B

TYPE CØUNTER END WINDØW — BIAS — BIAS WIDTH — 250175 C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2										.		D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3	4	11	1958	0927				15	1	3.	25863	1	HSF	250175	E
3	4	11	1958	1127				15	1	3.	22721	1	HSF	250175	F
3	4	11	1958	1327				15	1	3.	20814	1	HSF	250175	G
3	4	11	1958	1527				15	1	3.	19588	1	HSF	250175	H
3	4	11	1958	2047				15	1	3.	17794	1	DP	250175	J
3	4	11	1958	2257				15	1	3.	17725	1	WR	250175	K
3										.					L
3										.					M
3										.					N
3										.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
250168	1	6					250168	A

FØIL LØCATIØN	FØIL CARD 3 OF CONFIGURATIØN 39A	250168	B
TYPE CØUNTER	END WINDØW — BIAS — BIAS WIDTH	250168	C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2										.		D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3	4	11	1958	0242		36	1	15	1	3.	36443	1	Counted by WP	250168	E
3	4	11	1958	0500		36	1	15	1	3.	30944	1	Counted by WP	250168	F
3	4	11	1958	0640		36	1	15	1	3.	28838	1	Counted by WP	250168	G
3	4	11	1958	1121		36	1	15	1	4.	34263	1	Counted by BW	250168	H
3	4	11	1958	1451		36	1	15	1	3.	25072	1	Counted by HSF	250168	J
3	4	11	1958	1703		36	1	15	1	3.	24634	1	Counted by WP	250168	K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P	Foil Number	
120177	7	2	19	41	1	120177	A

FØIL LØCATIØN FØIL CARD 1 ØF CØNFIGURATIØN 39A — 120177 B

TYPE CØUNTER 4 PI GAS FLØW — BIAS — BIAS WIDTH — 120177 C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2												D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3	4	11	1958	1058				59	1	3.	288059		BJW	120177	E
3	4	11	1958	1650				59	1	3.	219365		BP	120177	F
3	4	12	1958	1406				78	1	3.	81024		FS	120177	G
3	4	12	1958	1643				78	1	3.	71922		CSW	120177	H
3	4	14	1958	0546				50	1	3.	14117		BP	120177	J
3	4	14	1958	1007				48	1	3.	11444		FS	120177	K
3	4	14	1958	1638				48	1	3.	12007		BP	120177	L
3	4	15	1958	0248				48	1	10.	19724		BP	120177	M
3	4	15	1958	1147				38	1	10.	13737		BJW	120177	N
3	4	15	1958	1727				38	1	10.	11622		BP	120177	P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No. | R | Times Ctd. | Ctr. No. | Shelf | P | Foil Number

A: FØIL LØCATIØN

B: TYPE CØUNTER BIAS BIAS WIDTH

C: Pre-irradiation data (if P = 1)

D: 2 | Month | Day | Year | Mil. Time | Time from 0000 (min) | Ctr. No. | Shelf | BKG Total Counts | BKG Count Duration (min.) | Pre-irradiation Count duration | Pre-irradiation Total Counts

Fill out a card for each time counted

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	Row
3	4	16	1958	0105				38	1	10.	8551		DMC	120177	E
3	4	16	1958	0945				22	1	10.	6384		DR	120177	F
3	4	16	1958	1730				31	1	10.	5001		DR	120177	G
3	4	17	1958	0053				22	1	10.	4185		DMC	120177	H
3	4	17	1958	0910				31	1	10.	3458		DR	120177	J
3	4	17	1958	1700				31	1	10.	2934		DR	120177	K
3	4	18	1958	0050				31	1	10.	2493		DMC	120177	L
3	4	18	1958	1559				35	1	10.	2078		DR	120177	M
3	4	20	1958	0034				29	1	10.	1397		DMC	120177	N
3										.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
13019	9	3	12	4	1		130199	A
FØIL	LØCATIØN	FOIL	CARD 1 OF CONFIGURATION 39A				130199	B
TYPE	CØUNTER	GAMMA SCINT	BIAS 19 VOLTS	BIAS WIDTH			130199	C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count Duration	Pre-irradiation Total Counts	
2											.	D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3	4	10	1958	2206				40	1	1.	32423		JK	130199	E
3	4	11	1958	0216				35	1	3.	79667	1	DAP	130199	F
3	4	11	1958	1406				28	1	3.	45483		PW	130199	G
3	4	11	1958	2130				28	1	3.	32352	1	JK	130199	H
3	4	12	1958	1013				35	1	3.	17919		PW	130199	J
3	4	12	1958	2226				30	1	3.	10151	1	GN	130199	K
3	4	14	1958	1045				32	1	3.	1872		PW	130199	L
3	4	14	1958	2116				30	1	3.	1152	1	LJ	130199	M
3	4	15	1958	0206				30	1	10.	3499		DHR	130199	N
3	4	15	1958	0852				30	1	5.	1333	1	PW	130199	P

FOIL COUNTING DATA

Card columns 1–80

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
								A
FØIL	LØCATIØN							B
TYPE	CØUNTER		BIAS			BIAS WIDTH		C

Pre-irradiation data (if P = 1)

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2										.		D

Fill out a card for each time counted

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3	4	15	1958	1701				30	1	10.	1787		Counted by LJ	130199	E
3	4	16	1958	0045				30	1	10.	1460	1	Counted by DHR	130199	F
3										.			Counted by		G
3										.			Counted by		H
3										.			Counted by		J
3										.			Counted by		K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
130284	3	6	4	1			130284	A

FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A — 130284 B

TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS BIAS WIDTH — 130284 C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count Duration	Pre-irradiation Total Counts		
2										.			D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3	4	10	1958	2212				57	1	1.	9625		Counted by JK	130284	E
3	4	11	1958	0223				42	1	3.	23346		Counted by PMC	130284	F
3	4	11	1958	0623				44	1	3.	19377		Counted by PMC	130284	G
3	4	11	1958	1850				84	1	3.	10088		Counted by JK	130284	H
3	4	12	1958	1025				55	1	3.	5338		Counted by PW	130284	J
3	4	14	1958	1524				60	1	3.	589		Counted by PMC	130284	K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
130380	3	6	4	1			130380	A

FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A — 130380 B

TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS BIAS WIDTH — 130380 C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts		
2										.			D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3	4	10	1958	2208				40	1	3.	7727		Counted by JK	130380	E
3	4	11	1958	0138				33	1	5.	10728		Counted by PHR	130380	F
3	4	11	1958	1441				28	1	3.	3471		Counted by PW	130380	G
3	4	11	1958	2158				28	1	3.	2579		Counted by JK	130380	H
3	4	12	1958	1119				35	1	3.	1355		Counted by PW	130380	J
3	4	12	1958	2257				30	1	3.	819		Counted by GD	130380	K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P

DATA LOCATION

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

Number of Data Locations

3 — NØ. LØC.

Fill out a set of three cards for each data location. If bare and covered foils are used at the same location, the odd foils should be bare, the even should be covered. X = 1 if covered foil.

DATA LØCATIØN FØIL CARD 1 ØF CØNFIGURATIØN 39A — C 39A 1 A

Foil No. 1, Foil No. 2, Foil No. 3, Foil No. 4, Foil No. 5, Foil No. 6, Foil No. 7, Foil No. 8, Foil No. 9, Foil No. 10

290794 250177 120177 130199 — C 39A 1 B

X_2 0, X_4 0, X_6, X_8, X_{10} — C 39A 1 C

DATA LØCATIØN FØIL CARD 2 ØF CØNFIGURATIØN 39A — C 39A 2 A

Foil No. 1, Foil No. 2, Foil No. 3, Foil No. 4, Foil No. 5, Foil No. 6, Foil No. 7, Foil No. 8, Foil No. 9, Foil No. 10

290783 250175 130284 — C 39A 2 B

X_2 0, X_4 0, X_6, X_8, X_{10} — C 39A 2 C

DATA LØCATIØN FØIL CARD 3 ØF CØNFIGURATIØN 39A — C 39A 3 A

Foil No. 1, Foil No. 2, Foil No. 3, Foil No. 4, Foil No. 5, Foil No. 6, Foil No. 7, Foil No. 8, Foil No. 9, Foil No. 10

290778 250168 130380 — C 39A 3 B

X_2 0, X_4 0, X_6, X_8, X_{10} — C 39A 3 C

Fill out pages 4-6 for the next configuration

CONFIGURATION DATA

Card columns: 1–47, 73–80

Number of Configurations or Reactor Runs (use only once)

Columns 1–47	Columns 73–80
	NØ . RUNS
CØNFIGURATION SSR-CE CONFIGURATION VI-C	C SSR

No. of Power Levels	Month	Day	Year	Mil. Time	Time from 0000 (min)	No. of Foils	Auto CE	Reactor Run No.	Columns 73–80
1 1						9			SDT C SSR

Fill out a card for each Power Level

Actual Power Level (Watts)	% Power uncertainty	Minutes at Power	Columns 73–80
42.82	20.	20.	C SSR PL 1
.	.	.	C PL 2
.	.	.	C PL 3
.	.	.	C PL 4
.	.	.	C PL 5
.	.	.	C PL 6
.	.	.	C PL 7
.	.	.	C PL 8
.	.	.	C PL 9
.	.	.	C PL 0

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
160230	2	1	11	1			160230	A

FØIL LØCATIØN RADIAL SHIELD POSITION 1 SSR-VI-C — 160230 B

TYPE CØUNTER BETA SCINT BIAS 5 VOLTS BIAS WIDTH — 160230 C

Pre-irradiation data (if P = 1)

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2									.		D

Fill out a card for each time counted

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)			
3				5937			70	1	10.	1793		Counted by C49	160230	E
3									.			Counted by		F
3									.			Counted by		G
3									.			Counted by		H
3									.			Counted by		J
3									.			Counted by		K
3									.			Counted by		L
3									.			Counted by		M
3									.			Counted by		N
3									.			Counted by		P

FOIL COUNTING DATA

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
29010	4	1	1	13	1		290104	A

FØIL LØCATIØN RADIAL SHIELD POSITION 1 SSR-VI-C — 290104 B

TYPE CØUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS — 290104 C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count Duration	Pre-irradiation Total Counts		
2										.			D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Foil Number	
3					95			1263	5	5.	2278	Counted by EHB	290104	E
3										.		Counted by		F
3										.		Counted by		G
3										.		Counted by		H
3										.		Counted by		J
3										.		Counted by		K
3										.		Counted by		L
3										.		Counted by		M
3										.		Counted by		N
3										.		Counted by		P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No. 29011 | R 4 | Times Ctd. 1 | Ctr. No. 1 | Shelf 14 | P 1 | Foil Number 290114 | A

FØIL LØCATIØN RADIAL SHIELD POSITION 1 SSR-VI-C | 290114 | B

TYPE CØUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS | 290114 | C

Pre-irradiation data (if P = 1)

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2									.		D

Fill out a card for each time counted

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Foil Number	
3				86			1726	5	5.	2614	Counted by #HB	290114	E
3									.		Counted by		F
3									.		Counted by		G
3									.		Counted by		H
3									.		Counted by		J
3									.		Counted by		K
3									.		Counted by		L
3									.		Counted by		M
3									.		Counted by		N
3									.		Counted by		P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
290113	1	1	14	1			290113	A
FØIL LØCATIØN	RADIAL SHIELD POSITION 1 SSR-VI-C						290113	B
TYPE CØUNTER	GAMMA SCINT	BIAS 13 VOLTS	BIAS WIDTH 8 VOLTS				290113	C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2										.		D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3					93			1726	5	2.	2571		Counted by FMS	290113	E
3										.			Counted by		F
3										.			Counted by		G
3										.			Counted by		H
3										.			Counted by		J
3										.			Counted by		K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
29011	1	1	1	4	1		290111	A

FØIL LØCATIØN RADIAL SHIELD POSITION 1 SSR-VI-C — 290111 B

TYPE CØUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS — 290111 C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts		
2										.			D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		
3					926			1249	5	5.	11920	Counted by EHB	290111	E
3										.		Counted by		F
3										.		Counted by		G
3										.		Counted by		H
3										.		Counted by		J
3										.		Counted by		K
3										.		Counted by		L
3										.		Counted by		M
3										.		Counted by		N
3										.		Counted by		P

FOIL COUNTING DATA

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
290102	1	1	18	1			290102	A

FØIL LØCATIØN	RADIAL SHIELD PØSITIØN 2 SSR-VI-C		290102	B
TYPE CØUNTER	GAMMA SCINT	BIAS 13 VOLTS	BIAS WIDTH 8 VOLTS	290102	C

Pre-irradiation data (if P = 1)

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2									.		D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3					86	13	1	1263	5	1.	1973		Counted by EHB	290102	E
3										.			Counted by		F
3										.			Counted by		G
3										.			Counted by		H
3										.			Counted by		J
3										.			Counted by		K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
290112	2	1	14	1			290112	A

FØIL LØCATIØN RADIAL SHIELD POSITION 2 SSR-VI-C — 290112 — B

TYPE CØUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS — 290112 — C

Pre-irradiation data (if P = 1)

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2									.		D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)			
3					912			1249	5	5.	6329		Counted by EHB	290112	E
3										.			Counted by		F
3										.			Counted by		G
3										.			Counted by		H
3										.			Counted by		J
3										.			Counted by		K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P
3															

FOIL COUNTING DATA

Card columns 1–80

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	
150101	4	5	14	1	1		150101	A
FØIL LØCATIØN	RADIAL SHIELD POSITION 1 SSR-VI-C						150101	B
TYPE CØUNTER	GAMMA SCINT	BIAS 5 VØLTS	BIAS WIDTH				150101	C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	Foil Number	
2								82	1	5.	100	150101	D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3					100			86	1	5.	17263		ABD	150101	E
3					200			86	1	5.	15946		ABB	150101	F
3					300			86	1	5.	14231		ABD	150101	G
3					400			86	1	5.	12626		ABD	150101	H
3					500			86	1	5.	10747		ABD	150101	J
3										.					K
3										.					L
3										.					M
3										.					N
3										.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	Card
290101	1	1	13		1		290101	A

FØIL LØCATIØN RADIAL SHIELD POSITION 1 SSR-VI-C — 290101 — B

TYPE CØUNTER GAMMA SCINT — BIAS 13 VOLTS — BIAS WIDTH 8 VOLTS — 290101 — C

Pre-irradiation data (if P = 1)

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	
2										.		D

Fill out a card for each time counted

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3					84			1263	5	1.	10023		Counted by EHB	290101	E
3										.			Counted by		F
3										.			Counted by		G
3										.			Counted by		H
3										.			Counted by		J
3										.			Counted by		K
3										.			Counted by		L
3										.			Counted by		M
3										.			Counted by		N
3										.			Counted by		P

DATA LOCATION

Number of Data Locations

2

NØ. LØC.

Fill out a set of three cards for each data location. If bare and covered foils are used at the same location, the odd foils should be bare, the even should be covered. X = 1 if covered foil.

DATA LØCATIØN RADIAL SHIELD POSITION 1 SSR-VI-C — C SSR 1 A

Foil No. 1	Foil No. 2	Foil No. 3	Foil No. 4	Foil No. 5	Foil No. 6	Foil No. 7	Foil No. 8	Foil No. 9	Foil No. 10	Card
290101	290111	290114	290104	160230	290113					C SSR 1 B
	X_2		X_4		X_6		X_8		X_{10}	
	1		1		1					C SSR 1 C

DATA LØCATIØN RADIAL SHIELD POSITION 2 SSR-VI-C — C SSR 2 A

Foil No. 1	Foil No. 2	Foil No. 3	Foil No. 4	Foil No. 5	Foil No. 6	Foil No. 7	Foil No. 8	Foil No. 9	Foil No. 10	Card
290102	290112	150101	170000							C SSR 2 B
	X_2		X_4		X_6		X_8		X_{10}	
	1		0							C SSR 2 C

DATA LØCATIØN — C A

Foil No. 1	Foil No. 2	Foil No. 3	Foil No. 4	Foil No. 5	Foil No. 6	Foil No. 7	Foil No. 8	Foil No. 9	Foil No. 10	Card
										C B
	X_2		X_4		X_6		X_8		X_{10}	
										C C

Fill out pages 4-6 for the next configuration

CONFIGURATION DATA

Number of Configurations or Reactor Runs (use only once)

Columns 1–72	Columns 73–80
	NØ. RUNS
CØNFIGURATION USS-VAL TEST WELL C-6 OF GETR	C VAL

No. of Power Levels	Month	Day	Year	Mil. Time	Time from 0000 (min)	No. of Foils	Auto CE	Reactor Run No.	Columns 73–80
1 1					33099	3			SDT CVAL

Fill out a card for each Power Level

Actual Power Level (Watts)	% Power uncertainty	Minutes at Power	Columns 73–80
1490.	10.	25.4	CVALPL1
.	.	.	C PL2
.	.	.	C PL3
.	.	.	C PL4
.	.	.	C PL5
.	.	.	C PL6
.	.	.	C PL7
.	.	.	C PL8
.	.	.	C PL9
.	.	.	C PL0

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P		Foil Number	Card
130114	6	9	5	1			130114	A

FOIL LOCATION: TEST WELL C-6 OF THE GETR 1A1 — 130114 — B

TYPE COUNTER: GAMMA SCINT — BIAS: 19 VOLTS — BIAS WIDTH: — 130114 — C

Pre-irradiation data (if P = 1)

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts		Card
2										.			D

Fill out a card for each time counted

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	
3					33139			381	1	1.	235477		ERB	130114	E
3					33140			381	1	1.	217662		ERB	130114	F
3					33150			381	1	1.	119582		ERB	130114	G
3					33238			381	1	3.	79548		ERB	130114	H
3					33844			415	1	3.	49846		ERB	130114	J
3					34483			395	1	2.	20636		ERB	130114	K
3					35082			314	1	2.	13278		ERB	130114	L
3					36681			75	1	3.	3526		ERB	130114	M
3					36865			68	1	3.	3014		ERB	130114	N
3										.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P	Foil Number	Card
130129	6	6	5	1		130129	A

FOIL LOCATION TEST WELL C-6 OF THE GETR 1A7 — 130129 — B

TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS BIAS WIDTH — 130129 — C

Pre-irradiation data (if P = 1)

Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	Card
2									.		D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	Card
3					33129			381	1	1.	85788		ERB	130129	E
3					33131			381	1	1.	77975		ERB	130129	F
3					33138			381	1	1.	48227		ERB	130129	G
3					33145			381	1	1.	31393		ERB	130129	H
3					33869			415	1	3.	10493		ERB	130129	J
3					34520			386	1	5.	11103		ERB	130129	K
3										.					L
3										.					M
3										.					N
3										.					P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No.	R	Times Ctd.	Ctr. No.	Shelf	P	Foil Number	
920858	5	33	2	1	1	920858	A

FOIL LOCATION 6-INCH POSITION IN WELL A OF THE GETR — 920858 — B

TYPE COUNTER GAMMA SCINT BIAS 33.1 VOLTS BIAS WIDTH — 920858 — C

Pre-irradiation data (if P = 1)

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	Foil Number	
2					32815	2	1	69	1	3.	10184	920858	D

Fill out a card for each time counted

	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3					33110			61	1	1.	886340		Counted by ______	920858	E
3					33117			61	1	1.	671815		Counted by ______	920858	F
3					33124			61	1	1.	539082		Counted by ______	920858	G
3					33128			61	1	1.	485078		Counted by ______	920858	H
3					33135			61	1	1.	403502		Counted by ______	920858	J
3					33141			61	1	1.	347657		Counted by ______	920858	K
3					33149			61	1	1.	295911		Counted by ______	920858	L
3					33155			61	1	1.	265491		Counted by ______	920858	M
3					33159			61	1	1.	246266		Counted by ______	920858	N
3					33166			61	1	1.	219832		Counted by ______	920858	P

FOIL COUNTING DATA

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No. | R | Times Ctd. | Ctr. No. | Shelf | P | Foil Number | A

FØIL TYPE | LØCATIØN | BIAS | BIAS WIDTH | B, C

CØUNTER

Pre-irradiation data (if P = 1)

Month | Day | Year | Mil. Time | Time from 0000 (min) | Ctr. No. | Shelf | BKG Total Counts | BKG Count Duration (min.) | Pre-irradiation Count duration | Pre-irradiation Total Counts | D

2

Fill out a card for each time counted

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	
3					33172			61	1	1.	198156		Counted by	920858	E
3					33177			61	1	1.	184588		Counted by	920858	F
3					33183			61	1	1.	170017		Counted by	920858	G
3					33190			61	1	1.	155253		Counted by	920858	H
3					33196			61	1	1.	141600		Counted by	920858	J
3					33202			61	1	1.	132845		Counted by	920858	K
3					33209			61	1	1.	122845		Counted by	920858	L
3					33219			61	1	1.	110238		Counted by	920858	M
3					33227			61	1	1.	101161		Counted by	920858	N
3					33235			61	1	1.	93321		Counted by	920858	P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No. | R | Times Ctd. | Ctr. No. | Shelf | P | Foil Number

A: F Ø I L L Ø C A T I Ø N

B: T Y P E C Ø U N T E R B I A S B I A S W I D T H

C

Pre-irradiation data (if P = 1)

D: 2 | Month | Day | Year | Mil. Time | Time from 0000 (min) | Ctr. No. | Shelf | BKG Total Counts | BKG Count Duration (min.) | Pre-irradiation Count duration | Pre-irradiation Total Counts

Fill out a card for each time counted

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)		Foil Number	Row
3					33241			61	1	1.	84988		Counted by ______	920858	E
3					33262			61	1	1.	73543		Counted by ______	920858	F
3					33291			61	1	1.	58649		Counted by ______	920858	G
3					33448			61	1	1.	23278		Counted by ______	920858	H
3					33748			61	1	3.	37009		Counted by ______	920858	J
3					33763			67	1	3.	38175		Counted by ______	920858	K
3					34096			66	1	3.	25500		Counted by ______	920858	L
3					34398			71	1	2.	15252		Counted by ______	920858	M
3					34588			74	1	2.	13409		Counted by ______	920858	N
3					35365			63	1	2.	15562		Counted by ______	920858	P

FOIL COUNTING DATA

R: 1 = (n,γ) 2 = (n,p) 3 = (n,α) 4 = (n,2n) 5 = (n,f) 6 = multiple

Foil No. | R | Times Ctd. | Ctr. No. | Shelf | P | Foil Number

A: F Ø I L L Ø C A T I Ø N

B: T Y P E C Ø U N T E R B I A S B I A S W I D T H

C

Pre-irradiation data (if P = 1)

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Counts	BKG Count Duration (min.)	Pre-irradiation Count duration	Pre-irradiation Total Counts	Row
2										.		D

Fill out a card for each time counted

Card	Month	Day	Year	Mil. Time	Time from 0000 (min)	Ctr. No.	Shelf	BKG Total Cts.	BKG Count Duration (min.)	Count Duration (min.)	Total Counts	S (= 1 if unnumbered side)	Counted by	Foil Number	Row
3					36148			42	1	2.	9131		Counted by ______	920858	E
3					37297			50	1	3.	12630		Counted by ______	920858	F
3					38674			54	1	3.	11723		Counted by ______	920858	G
3										.			Counted by ______		H
3										.			Counted by ______		J
3										.			Counted by ______		K
3										.			Counted by ______		L
3										.			Counted by ______		M
3										.			Counted by ______		N
3										.			Counted by ______		P

DATA LOCATION

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

Number of Data Locations 0 N Ø . L Ø C .

Fill out a set of three cards for each data location. If bare and covered foils are used at the same location, the odd foils should be bare, the even should be covered. X = 1 if covered foil.

D A T A L Ø C A T I Ø N C A

Foil No. 1 Foil No. 2 Foil No. 3 Foil No. 4 Foil No. 5 Foil No. 6 Foil No. 7 Foil No. 8 Foil No. 9 Foil No. 10 C B

X_2 X_4 X_6 X_8 X_{10} C C

D A T A L Ø C A T I Ø N C A

Foil No. 1 Foil No. 2 Foil No. 3 Foil No. 4 Foil No. 5 Foil No. 6 Foil No. 7 Foil No. 8 Foil No. 9 Foil No. 10 C B

X_2 X_4 X_6 X_8 X_{10} C C

D A T A L Ø C A T I Ø N C A

Foil No. 1 Foil No. 2 Foil No. 3 Foil No. 4 Foil No. 5 Foil No. 6 Foil No. 7 Foil No. 8 Foil No. 9 Foil No. 10 C B

X_2 X_4 X_6 X_8 X_{10} C C

Fill out pages 4-6 for the next configuration

INPUT DATA LISTING

```
NAME      L. K. ZOLLER            PHONE 876-0486
FACILITY/LAB     MARSHALL SPACE FLIGHT CENTER
TEST      SAMPLE PROBLEM FOR FOIL DATA REDUCTION PROGRAM                                  CONSTANT
  11                                                                                     FOIL C 1
29  7 1   .788  .750 .017  63.540  69.000 9.0176-04                                      FOIL C 2
79  1 1   .100  .394 .002 197.000 100.000 1.7824-04                                      FOIL C 3
12  1 2   .329  .750 .062  24.320  78.800 7.6857-04 4.8000-02                            FOIL C 4
13  1 3   .577  .750 .030  26.980 100.000 7.6857-04 1.1000-01                            FOIL C 5
25  1 1   .007  .394 .002  54.940 100.000 4.4774-03                                      FOIL C 6
16  2 2  2.850  .750 .250  32.066  95.000 3.3541-05 3.0000-01 5.0000-01FOIL C 7
13  2 3   .577  .750 .030  26.980 100.000 7.6857-04 1.1000-01                            FOIL C 8
13  3 3   .577  .750 .030  26.980 100.000 7.6857-04 1.1000-01                            FOIL C 9
29  1 1  8.037  .750 .125  63.540  69.000 9.0176-04                                      FOIL C10
13  1 6   .577  .750 .030  26.980 100.000           1.1000-01                            FOIL C10
13  1 6 5.2022-02 7.0124-02 7.3576-02 7.6857-04 7.6857-04                                FOIL C10
13  1 6     30     60     90     9C                                                      FOIL C11
92  8 5  4.824  .750 .025 238.125 100.000 0.0000-00 5.4000-01                            FOIL C11
92  8 5 3.0202-02 1.5775-02 9.1938-03 2.1239-03 7.3334-04                                FOIL C11
92  8 5     40    100     275     650                                                    NO. CTRS
  13                                                                                     CTR C  1
31 1 29 07 1 2.04-04    .455   10.                                                       CTR C  2
32 1 29 07 1 1.92-04    .452   10.                                                       CTR C  3
33 1 29 07 1 2.88-04    .553   10.                                                       CTR C  4
37 1 29 07 1 1.80-04    .490   10.                                                       CTR C  5
 4 1 13 00 3 2.80-05   4.100   10.                                                       CTR C  6
41 1 12 01 2 8.70-07  56.300   10.                                                       CTR C  7
32 1 25 01 1 1.92-04   6.500   10.                                                       CTR C  8
33 1 25 01 1 2.88-04   6.670   10.                                                       CTR C  9
36 1 25 01 1 1.97-04   6.610   10.                                                       CTR C 10
 5 1 13 01 6 2.80-05   4.330   10.                                                       CTR C 11
13 1 29 01 1          15.494   20.                                                       CTR C 12
14 1 29 01 1          13.894   20.                                                       CTR C 13
11 1 16 02 2           8.629   20.                                                       NO. RUNS
  3                                                                                      C 39A  1
CONFIGURATION OTT 39A                                                                    SDT C39A
 4 1  4  9 1958 1935                10                                                   C39APL 1
      80.     10.     31.5                                                               C39APL 2
    1000.      5.     35.5                                                               C39APL 3
   20000.      5.     54.                                                                C39APL 4
  500000.      5.    180.                                                                290794 A
290794 1  3 33 1                                                                         290794 B
FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A                                           290794 C
TYPE COUNTER END WINDOW                                                                  290794 E
3  4 11 1958 0959                   16   1  3.     38947 1                               290794 F
3  4 11 1958 1747                   16   1  3.     29371 1                               290794 G
3  4 12 1958 1015                   17   1  5.     18371 1                               290783 A
290783 1  3 31 1                                                                         290783 B
FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A                                           290783 C
TYPE COUNTER END WINDOW                                                                  290783 E
3  4 14 1958 0051                   16   1  3.     10554 1                               290783 F
3  4 14 1958 0825                  160  10  5.     11854 1                               290783 G
3  4 14 1958 1606                   14   1  7.     11104 1                               290778 A
290778 1  3 37 1                                                                         290778 B
FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A
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TYPE COUNTER END WINDOW                                                  290778 C
3  4 14 1958 0113                  17  1  3.     34287 1                 290778 E
3  4 14 1958 0846                  14  1  3.     23243 1                 290778 F
3  4 14 1958 2242                  14  1  3.     11012 1                 290778 G
250177 1  6 33 1                                                         250177 A
FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A                           250177 B
TYPE COUNTER END WINDOW                                                  250177 C
3  4 11 1958 1128                  16  1  3.     50133 1                 250177 E
3  4 11 1958 1328                  16  1  3.     46018 1                 250177 F
3  4 11 1958 1528                  16  1  3.     43988 1                 250177 G
3  4 11 1958 1830                  16  1  3.     41382 1                 250177 H
3  4 11 1958 2032                  16  1  3.     40839 1                 250177 J
3  4 11 1958 2258                  16  1  3.     40080 1                 250177 K
250175 1  6 32 1                                                         250175 A
FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A                           250175 B
TYPE COUNTER END WINDOW                                                  250175 C
3  4 11 1958 0927                  15  1  3.     25863 1                 250175 E
3  4 11 1958 1127                  15  1  3.     22721 1                 250175 F
3  4 11 1958 1327                  15  1  3.     20814 1                 250175 G
3  4 11 1958 1527                  15  1  3.     19588 1                 250175 H
3  4 11 1958 2047                  15  1  3.     17794 1                 250175 J
3  4 11 1958 2257                  15  1  3.     17725 1                 250175 K
250168 1  6                                                              250168 A
FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A                           250168 B
TYPE COUNTER END WINDOW                                                  250168 C
3  4 11 1958 0242         36 1     15  1  3.     36443 1                 250168 E
3  4 11 1958 0500         36 1     15  1  3.     30944 1                 250168 F
3  4 11 1958 0640         36 1     15  1  3.     28838 1                 250168 G
3  4 11 1958 1121         36 1     15  1  4.     34263 1                 250168 H
3  4 11 1958 1451         36 1     15  1  3.     25072 1                 250168 J
3  4 11 1958 1703         36 1     15  1  3.     24634 1                 250168 K
120177 2 19 41 1                                                         120177 A
FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A                           120177 B
TYPE COUNTER 4 PI GAS FLOW                                               120177 C
3  4 11 1958 1058                  59  1  3.    288059                   120177 E
3  4 11 1958 1650                  59  1  3.    219365                   120177 F
3  4 12 1958 1406                  78  1  3.     81024                   120177 G
3  4 12 1958 1643                  78  1  3.     71922                   120177 H
3  4 14 1958 0546                  50  1  3.     14117                   120177 J
3  4 14 1958 1007                  48  1  3.     11444                   120177 K
3  4 14 1958 1638                  48  1  3.     12007                   120177 L
3  4 15 1958 0248                  48  1 10.     19724                   120177 M
3  4 15 1958 1147                  38  1 10.     13737                   120177 N
3  4 15 1958 1727                  38  1 10.     11622                   120177 P
3  4 16 1958 0105                  38  1 10.      8551                   120177 E
3  4 16 1958 0945                  22  1 10.      6384                   120177 F
3  4 16 1958 1730                  31  1 10.      5001                   120177 G
3  4 17 1958 0053                  22  1 10.      4185                   120177 H
3  4 17 1958 0910                  31  1 10.      3458                   120177 J
3  4 17 1958 1700                  31  1 10.      2934                   120177 K
3  4 18 1958 0050                  31  1 10.      2493                   120177 L
3  4 18 1958 1559                  35  1 10.      2078                   120177 M
3  4 20 1958 0034                  29  1 10.      1397                   120177 N
130199 3 12  4 1                                                         130199 A
FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A                           130199 B
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TYPE COUNTER GAMMA SCINT     BIAS 19 VOLTS                                          130199 C
3  4 10 1958 2206                 40  1  1.     32423                               130199 E
3  4 11 1958 0216                 35  1  3.     79667 1                             130199 F
3  4 11 1958 1406                 28  1  3.     45483                               130199 G
3  4 11 1958 2130                 28  1  3.     32352 1                             130199 H
3  4 12 1958 1013                 35  1  3.     17919                               130199 J
3  4 12 1958 2226                 30  1  3.     10151 1                             130199 K
3  4 14 1958 1045                 32  1  3.      1872                               130199 L
3  4 14 1958 2116                 30  1  3.      1152 1                             130199 M
3  4 15 1958 0206                 30  1 10.      3499                               130199 N
3  4 15 1958 0852                 30  1  5.      1333 1                             130199 P
3  4 15 1958 1701                 30  1 10.      1787                               130199 E
3  4 16 1958 0045                 30  1 10.      1460 1                             130199 F
130284 3  6  4 1                                                                    130284 A
FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A                                      130284 B
TYPE COUNTER GAMMA SCINT     BIAS 19 VOLTS                                          130284 C
3  4 10 1958 2212                 57  1  1.      9625                               130284 E
3  4 11 1958 0223                 42  1  3.     23346                               130284 F
3  4 11 1958 0623                 44  1  3.     19377                               130284 G
3  4 11 1958 1850                 84  1  3.     10088                               130284 H
3  4 12 1958 1025                 55  1  3.      5338                               130284 J
3  4 14 1958 1524                 60  1  3.       589                               130284 K
130380 3  6  4 1                                                                    130380 A
FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A                                      130380 B
TYPE COUNTER GAMMA SCINT     BIAS 19 VOLTS                                          130380 C
3  4 10 1958 2208                 40  1  3.      7727                               130380 E
3  4 11 1958 0138                 33  1  5.     10728                               130380 F
3  4 11 1958 1441                 28  1  3.      3471                               130380 G
3  4 11 1958 2158                 28  1  3.      2579                               130380 H
3  4 12 1958 1119                 35  1  3.      1355                               130380 J
3  4 12 1958 2257                 30  1  3.       819                               130380 K
  3                                                                                 NO. LOC.
DATA LOCATION FOIL CARD 1 OF CONFIGURATION 39A                                      C 39A 1A
290794 250177 120177 130199                                                         C 39A 1B
      0         0                                                                   C 39A 1C
DATA LOCATION FOIL CARD 2 OF CONFIGURATION 39A                                      C 39A 2A
290783 250175 130284                                                                C 39A 2B
      0         0                                                                   C 39A 2C
DATA LOCATION FOIL CARD 3 OF CONFIGURATION 39A                                      C 39A 3A
290778 250168 130380                                                                C 39A 3B
      0         0                                                                   C 39A 3C
CONFIGURATION SSR-CE CONFIGURATION VI-C                                             C SSR  3
 1 1                             9                                                  SDT CSSR
     42.82  20.00  20.00                                                            CSSRPL 1
160230 2  1 11 1                                                                    160230 A
FOIL LOCATION RADIAL SHIELD POSITION 1   SSR-VI-C                                   160230 B
TYPE COUNTER BETA SCINT      BIAS 5 VOLTS                                           160230 C
3                      5937       70  1 10.      1793                               160230 E
290104 1  1 13 1                                                                    290104 A
FOIL LOCATION RADIAL SHIELD POSITION 1   SSR-VI-C                                   290104 B
TYPE COUNTER GAMMA SCINT     BIAS 13 VOLTS        BIAS WIDTH 8 VOLTS                290104 C
3                        95     1263  5  5.      2278                               290104 E
290114 1  1 14 1                                                                    290114 A
FOIL LOCATION RADIAL SHIELD POSITION 1   SSR-VI-C                                   290114 B
TYPE COUNTER GAMMA SCINT     BIAS 13 VOLTS        BIAS WIDTH 8 VOLTS                290114 C
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3                      86        1726  5  5.      2614                   290114 E
290113 1  1 14 1                                                         290113 A
FOIL LOCATION RADIAL SHIELD POSITION 1   SSR-VI-C                        290113 B
TYPE COUNTER GAMMA SCINT     BIAS 13 VOLTS       BIAS WIDTH 8 VOLTS      290113 C
3                      93        1726  5  2.      2571                   290113 E
290111 1  1 14 1                                                         290111 A
FOIL LOCATION RADIAL SHIELD POSITION 1   SSR-VI-C                        290111 B
TYPE COUNTER GAMMA SCINT     BIAS 13 VOLTS       BIAS WIDTH 8 VOLTS      290111 C
3                     926        1249  5  5.     11920                   290111 E
290102 1  1 18 1                                                         290102 A
FOIL LOCATION RADIAL SHIELD POSITION 2   SSR-VI-C                        290102 B
TYPE COUNTER GAMMA SCINT     BIAS 13 VOLTS       BIAS WIDTH 8 VOLTS      290102 C
3                      86 13 1   1263  5  1.      1973                   290102 E
290112 1  1 14 1                                                         290112 A
FOIL LOCATION RADIAL SHIELD POSITION 2   SSR-VI-C                        290112 B
TYPE COUNTER GAMMA SCINT     BIAS 13 VOLTS       BIAS WIDTH 8 VOLTS      290112 C
3                     912        1249  5  5.      6329                   290112 E
150101 4  5 14 1 1                                                       150101 A
FOIL LOCATION RADIAL SHIELD POSITION 2   SSR-VI-C                        150101 B
TYPE COUNTER GAMMA SCINT     BIAS 5 VOLTS                                150101 C
2                       0          82  1  5.       100                   150101 D
3                     100         886  1  5.     17263                   150101 E
3                     200          86  1  5.     15946                   150101 F
3                     300          86  1  5.     14231                   150101 G
3                     400          86  1  5.     12626                   150101 H
3                     500          86  1  5.     10747                   150101 J
290101    1 13 1                                                         290101 A
FOIL LOCATION RADIAL SHIELD POSITION 1   SSR-VI-C                        290101 B
TYPE COUNTER GAMMA SCINT     BIAS 13 VOLTS       BIAS WIDTH 8 VOLTS      290101 C
3                      84        1263  5  1.     10023                   290101 E
   2                                                                     NO. LOC.
DATA LOCATION RADIAL SHIELD POSITION 1   SSR-VI-C                        C SSR 1A
290101 290111 290114 290104 160230 290113                                C SSR 1B
     1             1             1                                       C SSR 1C
DATA LOCATION RADIAL SHIELD POSITION 2   SSR-VI-C                        C SSR 2A
290112 290102 150101 170000                                              C SSR 2B
     1                                                                   C SSR 2C
CONFIGURATION USS-VAL TEST WELL C-6 OF GETR                              C VAL  2
 1 1                   33099     3                                       SDT CVAL
    1490.    10.00   25.40                                               CVALPL 1
130114 6  9  5 1                                                         130114 A
FOIL LOCATION TEST WELL C-6 OF THE GETR  1A1                             130114 B
TYPE COUNTER GAMMA SCINT     BIAS 19 VOLTS       BIAS WIDTH              130114 C
3                   33139         381  1  1.    235477                   130114 E
3                   33140         381  1  1.    217662                   130114 F
3                   33150         381  1  1.    119582                   130114 G
3                   33238         381  1  3.     79548                   130114 H
3                   33844         415  1  3.     49846                   130114 J
3                   34483         395  1  2.     20636                   130114 K
3                   35082         314  1  2.     13278                   130114 L
3                   36681          75  1  3.      3526                   130114 M
3                   36865          68  1  3.      3014                   130114 N
130129 6  6  5 1                                                         130129 A
FOIL LOCATION TEST WELL C-6 OF THE GETR    1A7                           130129 B
TYPE COUNTER GAMMA SCINT     BIAS 19 VOLTS       BIAS WIDTH              130129 C
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3         33129        381   1   1.     85788          130129 E
3         33131        381   1   1.     77975          130129 F
3         33138        381   1   1.     48227          130129 G
3         33145        381   1   1.     31393          130129 H
3         33869        415   1   3.     10493          130129 J
3         34520        386   1   5.     11103          130129 K
920858 5 33  2 1 1                                     920858 A
FOIL LOCATION 6 INCH POSITION IN WELL A OF THE GETR    920858 B
TYPE COUNTER GAMMA SCINT    BIAS 33.1 VOLTS     BIAS WIDTH   920858 C
2         32815  2 1    69   1   3.     10184          920858 D
3         33110         61   1   1.    886340          920858 E
3         33117         61   1   1.    671815          920858 F
3         33124         61   1   1.    539082          920858 G
3         33128         61   1   1.    485078          920858 H
3         33135         61   1   1.    403502          920858 J
3         33141         61   1   1.    347657          920858 K
3         33149         61   1   1.    295911          920858 L
3         33155         61   1   1.    265491          920858 M
3         33159         61   1   1.    246266          920858 N
3         33166         61   1   1.    219832          920858 P
3         33172         61   1   1.    198156          920858 E
3         33177         61   1   1.    184588          920858 F
3         33183         61   1   1.    170017          920858 G
3         33190         61   1   1.    155253          920858 H
3         33196         61   1   1.    141600          920858 J
3         33202         61   1   1.    132845          920858 K
3         33209         61   1   1.    122537          920858 L
3         33219         61   1   1.    110238          920858 M
3         33227         61   1   1.    101161          920858 N
3         33235         61   1   1.     93321          920858 P
3         33241         61   1   1.     84988          920858 E
3         33262         61   1   1.     73543          920858 F
3         33291         61   1   1.     58649          920858 G
3         33448         61   1   1.     23278          920858 H
3         33748         61   1   3.     37009          920858 J
3         33763         67   1   3.     38175          920858 K
3         34096         66   1   3.     25500          920858 L
3         34398         71   1   2.     15252          920858 M
3         34588         74   1   2.     13409          920858 N
3         35365         63   1   2.     15562          920858 P
3         36148         42   1   2.      9131          920858 E
3         37297         50   1   3.     12630          920858 F
3         38674         54   1   3.     11723          920858 G
     0                                                 NO. LOC.
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NEUTRON ACTIVATION FOIL DATA REDUCTION PROGRAM

NAME L. K. ZOLLER PHONE 876-0486
FACILITY/LAB MARSHALL SPACE FLIGHT CENTER
TEST SAMPLE PROBLEM FOR FOIL DATA REDUCTION PROGRAM

STORED INPUT DATA

I	ATOMIC NUMBER	FOIL GROUP	REACTION NUMBER	FOIL MASS (GRAMS)	FOIL DIAMETER (INCH)	FOIL THICKNESS (INCH)	FOIL MOLECULAR WEIGHT	ISOTOPTC ABUNDANCE (PERCENT)	DECAY CONSTANT (PER MIN)	REACTION X-SECTION (BARNS)	SELF ABSORPTION CONSTANT
1	29	7	1	0.788	0.750	0.017	63.540	69.000	9.0176E-04	-0.	-0.
2	79	1	1	0.100	0.394	0.002	197.000	100.000	1.7824E-04	-0.	-0.
3	12	1	2	0.329	0.750	0.062	24.320	78.800	7.6857E-04	4.8000E-02	-0.
4	13	1	3	0.577	0.750	0.030	26.980	100.000	7.6857E-04	1.1000E-01	-0.
5	25	1	1	0.007	0.394	0.002	54.940	100.000	4.4774E-03	-0.	-0.
6	16	2	2	2.850	0.750	0.250	32.066	95.000	3.3541E-05	3.0000E-01	5.0000E-01
7	13	2	3	0.577	0.750	0.030	26.980	100.000	7.6857E-04	1.1000E-01	-0.
8	13	3	3	0.577	0.750	0.030	26.980	100.000	7.6857E-04	1.1000E-01	-0.
9	29	1	1	8.037	0.750	0.125	63.540	69.000	9.0176E-04	-0.	-0.
10	13	1	6	0.577	0.750	0.030	26.980	100.000	-0.	1.100CE-01	-0.
	13	1	6	5.2022E-02	DECAY	CONSTANT	TO BE USED BETWEEN		0. MINUTES AND	30. MINUTES	
	13	1	6	7.0124E-02	DECAY	CONSTANT	TO BE USED BETWEEN		30. MINUTES AND	60. MINUTES	
	13	1	6	7.3576E-02	DECAY	CONSTANT	TO BE USED BETWEEN		60. MINUTES AND	90. MINUTES	
	13	1	6	7.6857E-04	DECAY	CONSTANT	TO BE USED BETWEEN		90. MINUTES AND	90. MINUTES	
	13	1	6	7.6857E-04	DECAY	CONSTANT	TO BE USED FOR	TIME GREATER	THAN	90. MINUTES	
11	92	8	5	4.824	0.750	0.025	238.125	100.000	0.	5.4000E-01	-0.
	92	8	5	3.0202E-02	DECAY	CONSTANT	TO BE USED BETWEEN		0. MINUTES AND	40. MINUTES	
	92	8	5	1.5775E-02	DECAY	CONSTANT	TO BE USED BETWEEN		40. MINUTES AND	100. MINUTES	
	92	8	5	9.1938E-03	DECAY	CONSTANT	TO BE USED BETWEEN		100. MINUTES AND	275. MINUTES	
	92	8	5	2.1239E-03	DECAY	CONSTANT	TO BE USED BETWEEN		275. MINUTES AND	650. MINUTES	
	92	8	5	7.3334E-04	DECAY	CONSTANT	TO BE USED FOR	TIME GREATER	THAN	650. MINUTES	

REACTION NUMBER 1 = (N,GAMMA)   REACTION
REACTION NUMBER 2 = (N,PROTON) REACTION
REACTION NUMBER 3 = (N,ALPHA)   REACTION
REACTION NUMBER 4 = (N,2N)   REACTION
REACTION NUMBER 5 = (N,FISSION) REACTION
REACTION NUMBER 6 = MULTIPLE REACTIONS

J	COUNTER NUMBER	SHELF NUMBER	ATOMIC NUMBER	FOIL GROUP	REACTION NUMBER	RESOLUTION TIME (SECONDS)	EFFICIENCY FACTOR (PERCENT)	EFFICIENCY UNCERTAINTY (PERCENT)
1	31	1	29	7	1	2.04E-04	0.455	10.000
2	32	1	29	7	1	1.92E-04	0.452	10.000
3	33	1	29	7	1	2.88E-04	0.553	10.000
4	37	1	29	7	1	1.80E-04	0.490	10.000
5	4	1	13	0	3	2.80E-05	4.100	10.000
6	41	1	12	1	2	8.70E-07	56.300	10.000
7	32	1	25	1	1	1.92E-04	6.500	10.000
8	33	1	25	1	1	2.88E-04	6.670	10.000
9	36	1	25	1	1	1.97E-04	6.610	10.000
10	5	1	13	1	6	2.80E-05	4.330	10.000
11	13	1	29	1	1	-0.	15.494	20.000
12	14	1	29	1	1	-0.	13.894	20.000
13	11	1	16	2	2	-0.	8.629	20.000

FOIL REDUCTION DATA ARE GIVEN AS SATURATED ACTIVITY
CORRECTED TO REACTOR SHUTDOWN TIME
FOR THE FOLLOWING CONFIGURATION

CONFIGURATION OTT 39A

REACTOR POWER INPUT DATA

K	REACTOR POWER (WATTS)	POWER UNCERTAINTY (PERCENT)	TIME AT POWER (MINUTES)	INTEGRATED POWER (WATT-HOURS)
1	80.00	10.00	31.50	4.2000E 01
2	1000.00	5.00	35.50	5.9167E 02
3	20000.00	5.00	54.00	1.8000E 04
4	500000.00	5.00	180.00	1.5000E 06
				TOTAL = 1.5186E 06

REACTOR SHUTDOWN TIME 142295. MINUTES FROM 0000 HOUR JANUARY 1 DATE 4 9 1958 TIME 1935

POWER SATURATION FACTORS

I	FOIL INDEX	POWER SATURATION FACTORS (WATTS)
1	29071.	7.5749E 04
2	79011.	1.5979E 04
3	12012.	6.5332E 04
4	13013.	6.5332E 04
5	25011.	2.7864E 05
6	16022.	3.0468E 03
7	13023.	6.5332E 04
8	13033.	6.5332E 04
9	29011.	7.5749E 04
10	13016.	5.0001E 05
11	92085.	4.9891E 05

DATA REDUCTION FOR FOIL NUMBER 29 794
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A
TYPE COUNTER END WINDOW

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
US 33 1	2304.	16.00	13829.09	0.49	2.6813E 00	8.0812E 00	-0.
US 33 1	2772.	16.00	10257.10	0.57	3.0330E 00	9.1409E 00	-0.
US 33 1	3760.	17.00	3723.16	0.74	2.6834E 00	8.0874E 00	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	2.7992E 00 * 13.27 0/0	8.4365E 00 * 16.62 0/0	0. * 16.62 0/0
NUMBERED SIDE (NS)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
AVERAGE OF SIDES	2.7992E 00 * 13.27 0/0	8.4365E 00 * 16.62 0/0	0. * 16.62 0/0

DATA REDUCTION FOR FOIL NUMBER 29 783
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A
TYPE COUNTER END WINDOW

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
US 31 1	6076.	16.00	3544.59	0.98	2.0623E 01	7.5542E 01	-0.
US 31 1	6530.	16.00	2374.06	0.92	2.0801E 01	7.6193E 01	-0.
US 31 1	6991.	14.00	1580.89	0.98	2.0991E 01	7.6889E 01	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	2.0805E 01 * 13.33 0/0	7.6208E 01 * 16.67 0/0	0. * 16.67 0/0
NUMBERED SIDE (NS)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
AVERAGE OF SIDES	2.0805E 01 * 13.33 0/0	7.6208E 01 * 16.67 0/0	0. * 16.67 0/0

DATA REDUCTION FOR FOIL NUMBER 29 778
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A
TYPE COUNTER END WINDOW

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
US 37 1	6098.	17.00	11817.78	0.53	7.0135E 01	2.3856E 02	-0.
US 37 1	6550.	14.00	7918.03	0.65	7.0637E 01	2.4026E 02	-0.
US 37 1	7387.	14.00	3697.54	0.96	7.0166E 01	2.3866E 02	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	7.0313E 01 * 13.29 0/0	2.3916E 02 * 16.63 0/0	0. * 16.63 0/0
NUMBERED SIDE (NS)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
AVERAGE OF SIDES	7.0313E 01 * 13.29 0/0	2.3916E 02 * 16.63 0/0	0. * 16.63 0/0

DATA REDUCTION FOR FOIL NUMBER 25 177
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A
TYPE COUNTER END WINDOW

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
US 33 1	2393.	16.00	18152.33	0.43	4.1880E 05	1.0465E 05	-0.
US 33 1	2513.	16.00	16542.52	0.45	6.5316E 05	1.6321E 05	-0.
US 33 1	2633.	16.00	15756.77	0.46	1.0647E 06	2.6604E 05	-0.
US 33 1	2815.	16.00	14756.08	0.48	2.2523E 06	5.6280E 05	-0.
US 33 1	2937.	16.00	14548.69	0.48	3.8345E 06	9.5815E 05	-0.
US 33 1	3083.	16.00	14259.46	0.48	7.2259E 06	1.8056E 06	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	2.5749E 06 * 13.28 0/0	6.4340E 05 * 16.62 0/0	0. * 16.62 0/0
NUMBERED SIDE (NS)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
AVERAGE OF SIDES	2.5749E 06 * 13.28 0/0	6.4340E 05 * 16.62 0/0	0. * 16.62 0/0

DATA REDUCTION FOR FOIL NUMBER 25 175
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A
TYPE COUNTER END WINDOW

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
US 32 1	2272.	15.00	8850.58	0.62	1.1878E 05	3.0458E 04	-0.
US 32 1	2392.	15.00	7746.78	0.66	1.7793E 05	4.5623E 04	-0.
US 32 1	2512.	15.00	7080.53	0.69	2.7832E 05	7.1363E 04	-0.
US 32 1	2632.	15.00	6653.67	0.71	4.4758E 05	1.1476E 05	-0.
US 32 1	2952.	15.00	6031.09	0.75	1.7000E 06	4.3590E 05	-0.
US 32 1	3082.	15.00	6007.19	0.75	3.0305E 06	7.7705E 05	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	9.5885E 05 * 13.34 0/0	2.4586E 05 * 16.67 0/0	0. * 16.67 0/0
NUMBERED SIDE (NS)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
AVERAGE OF SIDES	9.5885E 05 * 13.34 0/0	2.4586E 05 * 16.67 0/0	0. * 16.67 0/0

DATA REDUCTION FOR FOIL NUMBER 25 168
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A
TYPE COUNTER END WINDOW

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
US 36 1	1867.	15.00	12637.30	0.51	2.7664E 04	6.9753E 03	-0.
US 36 1	2005.	15.00	10661.23	0.56	4.3292E 04	1.0916E 04	-0.
US 36 1	2105.	15.00	9910.94	0.58	6.2975E 04	1.5879E 04	-0.
US 36 1	2386.	15.00	8798.63	0.54	1.9673E 05	4.9605E 04	-0.
US 36 1	2596.	15.00	8578.13	0.63	4.9114E 05	1.2384E 05	-0.
US 36 1	2728.	15.00	8423.85	0.63	8.7096E 05	2.1961E 05	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	2.8213E 05 * 13.30 0/0	7.1136E 04 * 16.64 0/0	0. * 16.64 0/0
NUMBERED SIDE (NS)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
AVERAGE OF SIDES	2.8213E 05 * 13.30 0/0	7.1136E 04 * 16.64 0/0	0. * 16.64 0/0

DATA REDUCTION FOR FOIL NUMBER 12 177
(N,PROTON) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A
TYPE COUNTER 4 PI GAS FLOW

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 41 1	2363.	59.00	96094.54	0.19	3.4881E 01	1.0326E 00	8.6835E 02
NS 41 1	2716.	59.00	73140.28	0.21	3.4797E 01	1.0301E 00	8.6625E 02
NS 41 1	3991.	78.00	26940.58	0.35	3.4174E 01	1.0117E 00	8.5075E 02
NS 41 1	4148.	78.00	23904.34	0.38	3.4212E 01	1.0128E 00	8.5168E 02
NS 41 1	6371.	50.00	4655.99	0.86	3.6789E 01	1.0891E 00	9.1584E 02
NS 41 1	6632.	48.00	3766.88	0.96	3.6375E 01	1.0768E 00	9.0554E 02
NS 41 1	7023.	48.00	3954.57	0.94	5.1574E 01	1.5268E 00	1.2839E 03
NS 41 1	7633.	48.00	1924.46	0.81	4.0109E 01	1.1874E 00	9.9851E 02
NS 41 1	8172.	38.00	1335.73	0.99	4.2128E 01	1.2471E 00	1.0488E 03
NS 41 1	8512.	38.00	1124.22	1.10	4.6046E 01	1.3631E 00	1.1463E 03
NS 41 1	8970.	38.00	817.11	1.36	4.7587E 01	1.4087E 00	1.1847E 03
NS 41 1	9490.	22.00	616.41	1.50	5.3536E 01	1.5848E 00	1.3328E 03
NS 41 1	9955.	31.00	469.10	1.92	5.8245E 01	1.7242E 00	1.4500E 03
NS 41 1	10398.	22.00	396.50	2.02	6.9199E 01	2.0485E 00	1.7227E 03
NS 41 1	10895.	31.00	314.80	2.57	8.0498E 01	2.3830E 00	2.0040E 03
NS 41 1	11365.	31.00	262.40	2.96	9.6293E 01	2.8506E 00	2.3972E 03
NS 41 1	11835.	31.00	218.30	3.43	1.1496E 02	3.4033E 00	2.8620E 03
NS 41 1	12744.	35.00	172.80	4.32	1.8300E 02	5.4176E 00	4.5558E 03
NS 41 1	14699.	29.00	110.70	5.92	5.2677E 02	1.5594E 01	1.3114E 04

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	8.5325E 01 * 16.54 0/0	2.5259E 00 * 19.33 0/0	2.1241E 03 * 19.33 0/0
AVERAGE OF SIDES	8.5325E 01 * 16.54 0/0	2.5259E 00 * 19.33 0/0	2.1241E 03 * 19.33 0/0

DATA REDUCTION FOR FOIL NUMBER 13 199
(N,ALPHA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 1 OF CONFIGURATION 39A
TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 4 1	1591.	40.00	32881.12	0.55	2.9628E 00	1.2044E 00	4.9029E 02
US 4 1	1841.	35.00	26853.89	0.35	2.9323E 00	1.1920E 00	4.8525E 02
NS 4 1	2551.	28.00	15241.03	0.47	2.8721E 00	1.1675E 00	4.7529E 02
US 4 1	2995.	28.00	10810.54	0.56	2.8657E 00	1.1649E 00	4.7423E 02
NS 4 1	3758.	35.00	5954.70	0.76	2.8374E 00	1.1534E 00	4.6955E 02
US 4 1	4491.	30.00	3359.02	1.01	2.8115E 00	1.1429E 00	4.6526E 02
NS 4 1	6670.	32.00	592.18	2.62	2.6455E 00	1.0754E 00	4.3779E 02
US 4 1	7301.	30.00	354.07	3.55	2.5689E 00	1.0443E 00	4.2512E 02
NS 4 1	7591.	30.00	319.96	2.52	2.9011E 00	1.1793E 00	4.8008E 02
US 4 1	7997.	30.00	236.63	3.86	2.9313E 00	1.1916E 00	4.8508E 02
NS 4 1	8486.	30.00	148.71	4.65	2.6826E 00	1.0905E 00	4.4393E 02
US 4 1	8950.	30.00	116.01	5.76	2.9893E 00	1.2152E 00	4.9469E 02

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	2.8499E 00 * 15.40 0/0	1.1585E 00 * 18.36 0/0	4.7161E 02 * 18.36 0/0
NUMBERED SIDE (NS)	2.8169E 00 * 14.52 0/0	1.1451E 00 * 17.63 0/0	4.6615E 02 * 17.63 0/0
AVERAGE OF SIDES	2.8334E 00 * 21.17 0/0	1.1518E 00 * 25.46 0/0	4.6888E 02 * 25.46 0/0

DATA REDUCTION FOR FOIL NUMBER 13 284
(N,ALPHA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 2 OF CONFIGURATION 39A
TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 4 1	1597.	57.00	9611.43	1.03	8.7005E-01	3.5368E-01	1.4398E 02
NS 4 1	1848.	42.00	7768.36	0.66	8.5283E-01	3.4668E-01	1.4113E 02
NS 4 1	2088.	44.00	6434.53	0.73	8.4949E-01	3.4532E-01	1.4058E 02
NS 4 1	2835.	84.00	3283.95	1.06	7.6980E-01	3.1293E-01	1.2739E 02
NS 4 1	3770.	55.00	1725.81	1.48	8.2997E-01	3.3739E-01	1.3735E 02
NS 4 1	6949.	60.00	136.35	8.21	7.5480E-01	3.0683E-01	1.2491E 02

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	8.2116E-01 * 15.74 0/0	3.3380E-01 * 18.65 0/0	1.3589E 02 * 18.65 0/0
AVERAGE OF SIDES	8.2116E-01 * 15.74 0/0	3.3380E-01 * 18.65 0/0	1.3589E 02 * 18.65 0/0

DATA REDUCTION FOR FOIL NUMBER 13 380
(N,ALPHA) REACTION - SIMPLE DECAY

FOIL LOCATION FOIL CARD 3 OF CONFIGURATION 39A
TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 4 1	1593.	40.00	2538.77	1.18	2.2911E-01	9.3134E-02	3.7914E 01
NS 4 1	1803.	33.00	2114.75	1.02	2.2427E-01	9.1167E-02	3.7113E 01
NS 4 1	2586.	28.00	1129.62	1.80	2.1868E-01	8.8893E-02	3.6188E 01
NS 4 1	3023.	28.00	832.01	2.13	2.2535E-01	9.1607E-02	3.7292E 01
NS 4 1	3824.	35.00	416.76	3.27	2.0892E-01	8.4927E-02	3.4573E 01
NS 4 1	4522.	30.00	243.03	4.53	2.0833E-01	8.4686E-02	3.4475E 01

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	2.1911E-01 * 14.71 0/0	8.9069E-02 * 17.79 0/0	3.6259E 01 * 17.79 0/0
AVERAGE OF SIDES	2.1911E-01 * 14.71 0/0	8.9069E-02 * 17.79 0/0	3.6259E 01 * 17.79 0/0

CONFIGURATION 1 DATA SUMMARY

POSITION 1

DATA LOCATION FOIL CARD 1 OF CONFIGURATION 39A

N	FOIL NUMBER	DATA LOCATION	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)
1	290794.	1	2.7992E 00	8.4365E 00		
2	250177.	4	2.5749E 06	6.4340E 05		
3	120177.	7	8.5325E 01	2.5259E 00		
4	130199.	8	2.8334E 00	1.1518E 00		

POSITION 2

DATA LOCATION FOIL CARD 2 OF CONFIGURATION 39A

N	FOIL NUMBER	DATA LOCATION	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)
1	290788.	2	2.0805E 01	7.6208E 01		
2	250175.	5	9.5885E 05	2.4586E 05		
3	130284.	9	8.2116E-01	3.3380E-01		

POSITION 3

DATA LOCATION FOIL CARD 3 OF CONFIGURATION 39A

N	FOIL NUMBER	DATA LOCATION	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)
1	290778.	3	7.0313E 01	2.3916E 02		
2	250168.	6	2.8213E 05	7.1136E 04		
3	130380.	10	2.1911E-01	8.9069E-02		

FOIL REDUCTION DATA ARE GIVEN AS SATURATED ACTIVITY
CORRECTED TO REACTOR SHUTDOWN TIME
FOR THE FOLLOWING CONFIGURATION

CONFIGURATION SSR-CE CONFIGURATION VI-C

REACTOR POWER INPUT DATA

K	REACTOR POWER (WATTS)	POWER UNCERTAINTY (PERCENT)	TIME AT POWER (MINUTES)	INTEGRATED POWER (WATT-HOURS)
1	42.82	20.00	20.00	1.4273E 01
			TOTAL =	1.4273E 01

REACTOR SHUTDOWN TIME   0. MINUTES FROM 0000 HOUR JANUARY 1   DATE -0 -0 -0 TIME -0-0

POWER SATURATION FACTORS

I	FOIL INDEX	POWER SATURATION FACTORS (WATTS)
1	29071.	7.6534E-01
2	79011.	1.5237E-01
3	12012.	6.5317E-01
4	13013.	6.5317E-01
5	25011.	3.6678E 00
6	16022.	2.8714E-02
7	13023.	6.5317E-01
8	13033.	6.5317E-01
9	29011.	7.6534E-01
10	13016.	2.7692E 01
11	92085.	1.9415E 01

DATA REDUCTION FOR FOIL NUMBER 16 230
(N,PROTON) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 1 SSR-VI-C
TYPE COUNTER BETA SCINT BIAS 5 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 11 1	5937.	88.95	138.89	7.61	2.1802E 03	4.2110E 02	7.4705E 04

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	2.1802E 03 * 21.40 0/0	4.2110E 02 * 29.29 0/0	7.4705E 04 * 29.29 0/0
AVERAGE OF SIDES	2.1802E 03 * 21.40 0/0	4.2110E 02 * 29.29 0/0	7.4705E 04 * 29.29 0/0

DATA REDUCTION FOR FOIL NUMBER 29 1 4
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 1 SSR-VI-C
TYPE COUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 13 1	95.	252.60	203.00	5.86	5.2108E 01	5.6051E 00	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)			AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)			AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)		
UNNUMBERED SIDE (US)	0.	* 0.	0/0	0.	* 0.	0/0	0.	* 0.	0/0
NUMBERED SIDE (NS)	5.2108E 01	* 20.84	0/0	5.6051E 00	* 28.89	0/0	0.	* 28.89	0/0
AVERAGE OF SIDES	5.2108E 01	* 20.84	0/0	5.6051E 00	* 28.89	0/0	0.	* 28.89	0/0

DATA REDUCTION FOR FOIL NUMBER 29 114
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 1 SSR-VI-C
TYPE COUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 14 1	86.	345.20	177.60	7.42	4.5219E 01	5.4243E 00	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	4.5219E 01 * 21.33 0/0	5.4243E 00 * 29.24 0/0	0. * 29.24 0/0
AVERAGE OF SIDES	4.5219E 01 * 21.33 0/0	5.4243E 00 * 29.24 0/0	0. * 29.24 0/0

DATA REDUCTION FOR FOIL NUMBER 29 113
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 1 SSR-VI-C
TYPE COUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 14 1	93.	345.20	940.30	2.84	2.4093E 02	2.8901E 01	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	2.4093E 02 * 20.20 0/0	2.8901E 01 * 28.43 0/0	0. * 28.43 0/0
AVERAGE OF SIDES	2.4093E 02 * 20.20 0/0	2.8901E 01 * 28.43 0/0	0. * 28.43 0/0

DATA REDUCTION FOR FOIL NUMBER 29 111
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 1 SSR-VI-C
TYPE COUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 14 1	926.	249.80	2134.20	1.08	1.1590E 03	1.3903E 02	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	1.1590E 03 * 20.03 0/0	1.3903E 02 * 28.30 0/0	0. * 28.30 0/0
AVERAGE OF SIDES	1.1590E 03 * 20.03 0/0	1.3903E 02 * 28.30 0/0	0. * 28.30 0/0

DATA REDUCTION FOR FOIL NUMBER 29 1 2
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 2 SSR-VI-C
TYPE COUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS

ERROR - COUNTER INDEX 18129011. NOT LISTED IN TABLE OF STORED INPUT

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 13 1	86.	252.60	1720.40	2.61	4.3804E 02	4.7119E 01	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	4.3804E 02 * 20.17 0/0	4.7119E 01 * 28.40 0/0	0. * 28.40 0/0
AVERAGE OF SIDES	4.3804E 02 * 20.17 0/0	4.7119E 01 * 28.40 0/0	0. * 28.40 0/0

DATA REDUCTION FOR FOIL NUMBER 29 112
(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 2 SSR-VI-C
TYPE COUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 14 1	912.	249.80	1016.00	1.71	5.4483E 02	6.5355E 01	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	5.4483E 02 * 20.07 0/0	6.5355E 01 * 28.34 0/0	0. * 28.34 0/0
AVERAGE OF SIDES	5.4483E 02 * 20.07 0/0	6.5355E 01 * 28.34 0/0	0. * 28.34 0/0

DATA REDUCTION FOR FOIL NUMBER 15 1 1

ERROR - FOIL INDEX 15014. NOT LISTED IN TABLE OF STORED INPUT

FOIL LOCATION RADIAL SHIELD POSITION 2 SSR-VI-C

TYPE	COUNTER GAMMA SCINT	BIAS 5 VOLTS			
2	0	82	1	5.	100
3	100	886	1	5.	17263
3	200	86	1	5.	15946
3	300	86	1	5.	14231
3	400	86	1	5.	12626
3	500	86	1	5.	10747

DATA REDUCTION FOR FOIL NUMBER 29 1 1

ERROR - NO REACTION INDICATED ON DATA SHEET - DATA REDUCTION ASSUMES FOIL INDEX 29011.

(N,GAMMA) REACTION - SIMPLE DECAY

FOIL LOCATION RADIAL SHIELD POSITION 1 SSR-VI-C
TYPE COUNTER GAMMA SCINT BIAS 13 VOLTS BIAS WIDTH 8 VOLTS

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 13 1	84.	252.60	9770.40	1.03	2.4832E 03	2.6711E 02	-0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	2.4832E 03 * 20.03 0/0	2.6711E 02 * 28.30 0/0	0. * 28.30 0/0
AVERAGE OF SIDES	2.4832E 03 * 20.03 0/0	2.6711E 02 * 28.30 0/0	0. * 28.30 0/0

CONFIGURATION 2 DATA SUMMARY

POSITION 1

DATA LOCATION RADIAL SHIELD POSITION 1 SSR-VI-C

N	FOIL NUMBER	DATA LOCATION	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)
1	290101.	9	2.4832E 03	2.6711E 02		
2	290111.	5	1.1590E 03	1.3903E 02	1.3242E 03	1.2808E 02
3	290114.	3	4.5219E 01	5.4243E 00		
4	290104.	2	5.2108E 01	5.6051E 00	0.	0.
5	160230.	1	2.1802E 03	4.2110E 02		
6	290113.	4	2.4093E 02	2.8901E 01		

POSITION 2

DATA LOCATION RADIAL SHIELD POSITION 2 SSR-VI-C

N	FOIL NUMBER	DATA LOCATION	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	BARE FOIL MINUS FILTERED FOIL SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)
1	290112.	7	5.4483E 02	6.5355E 01		
2	290102.	6	4.3804E 02	4.7119E 01	1.0679E 02	1.8236E 01
3	150101.	0	0.	0.		
4	170000.	0	0.	0.		

FOIL REDUCTION DATA ARE GIVEN AS SATURATED ACTIVITY
CORRECTED TO REACTOR SHUTDOWN TIME
FOR THE FOLLOWING CONFIGURATION

CONFIGURATION USS-VAL TEST WELL C-6 OF GETR

REACTOR POWER INPUT DATA

K	REACTOR POWER (WATTS)	POWER UNCERTAINTY (PERCENT)	TIME AT POWER (MINUTES)	INTEGRATED POWER (WATT-HOURS)
1	1490.00	10.00	25.40	6.3077E 02
				TOTAL = 6.3077E 02

REACTOR SHUTDOWN TIME   33099. MINUTES FROM 0000 HOUR JANUARY 1   DATE -0 -0 -0   TIME -0-0

POWER SATURATION FACTORS

I	FOIL INDEX	POWER SATURATION FACTORS (WATTS)
1	29071.	3.3740E 01
2	79011.	6.7304E 00
3	12012.	2.8805E 01
4	13013.	2.8805E 01
5	25011.	1.6017E 02
6	16022.	1.2688E 00
7	13023.	2.8805E 01
8	13033.	2.8805E 01
9	29011.	3.3740E 01
10	13016.	1.0925E 03
11	92085.	7.9813E 02

DATA REDUCTION FOR FOIL NUMBER 13 114
MULTIPLE REACTIONS

FOIL LOCATION TEST WELL C-6 OF THE GETR 1A1
TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS BIAS WIDTH

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 5 1	40.	381.07	264166.91	0.19	4.0235E 03	1.5487E 03	6.3047E 05
NS 5 1	41.	381.07	241889.73	0.20	3.9519E 03	1.5211E 03	6.1923E 05
NS 5 1	51.	381.07	126268.61	0.28	4.1593E 03	1.6010E 03	6.5174E 05
NS 5 1	139.	381.07	26467.16	0.36	1.5470E 04	5.9546E 03	2.4241E 06
NS 5 1	745.	415.08	16330.09	0.47	1.5207E 04	5.8534E 03	2.3829E 06
NS 5 1	1384.	395.07	9972.85	0.75	1.5176E 04	5.8415E 03	2.3780E 06
NS 5 1	1983.	314.05	6345.59	0.95	1.5302E 04	5.8900E 03	2.3978E 06
NS 5 1	3582.	75.00	1100.98	1.96	9.0737E 03	3.4926E 03	1.4218E 06
NS 5 1	3766.	68.00	937.14	2.14	8.8967E 03	3.4244E 03	1.3941E 06

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	1.0140E 04 * 10.51 0/0	3.9030E 03 * 14.51 0/0	1.5889E 06 * 14.51 0/0
AVERAGE OF SIDES	1.0140E 04 * 10.51 0/0	3.9030E 03 * 14.51 0/0	1.5889E 06 * 14.51 0/0

DATA REDUCTION FOR FOIL NUMBER 92 858
(N,FISSION) REACTION - MULTIPLE DECAY

FOIL LOCATION 6 INCH POSITION IN WELL A OF THE GETR
TYPE COUNTER GAMMA SCINT BIAS 33.1 VOLTS BIAS WIDTH

ERROR - COUNTER INDEX 2192085. NOT LISTED IN TABLE OF STORED INPUT

PREIRRADIATION COUNTING DATA

COUNTER/SHELF NUMBER	TIME AT COUNTING (MIN FROM 0000)	TIME PRIOR TO REACTOR SHUTDOWN TIME (MIN)	BACKGROUND COUNT RATE (COUNTS/MIN)	COUNT RATE (COUNTS/MIN)
2 1	32815.	284.	69.00 * 12.0 0/0	3325.667 * 1.0 0/0

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 2 1	11.	134.95	886205.04	0.11	3.2088E 02	0.	0.
NS 2 1	18.	133.86	671681.13	0.12	3.0046E 02	0.	0.
NS 2 1	25.	132.79	538949.21	0.14	2.9784E 02	0.	0.
NS 2 1	29.	132.18	484945.82	0.14	3.0241E 02	0.	0.
NS 2 1	36.	131.13	403370.87	0.16	3.1076E 02	0.	0.
NS 2 1	42.	130.24	347526.75	0.17	3.1180E 02	0.	0.
NS 2 1	50.	129.08	295781.92	0.18	3.0107E 02	0.	0.
NS 2 1	56.	128.21	265362.79	0.19	2.9692E 02	0.	0.
NS 2 1	60.	127.65	246138.35	0.20	2.9335E 02	0.	0.
NS 2 1	67.	126.66	219705.34	0.21	2.9242E 02	0.	0.
NS 2 1	73.	125.83	198030.17	0.22	2.8973E 02	0.	0.
NS 2 1	78.	125.15	184462.85	0.23	2.9203E 02	0.	0.
NS 2 1	84.	124.33	169892.67	0.24	2.9567E 02	0.	0.
NS 2 1	91.	123.40	155129.60	0.25	3.0149E 02	0.	0.
NS 2 1	97.	122.61	141477.39	0.27	3.0226E 02	0.	0.
NS 2 1	103.	121.83	132723.17	0.27	3.0561E 02	0.	0.
NS 2 1	110.	120.93	122416.07	0.29	3.0061E 02	0.	0.
NS 2 1	120.	119.67	110118.33	0.30	2.9645E 02	0.	0.
NS 2 1	128.	118.68	101042.32	0.31	2.9278E 02	0.	0.

NS	2	1	136.	117.71	93203.29	0.33	2.9068E 02	0.	0.
NS	2	1	142.	116.99	84871.01	0.34	2.7970E 02	0.	0.
NS	2	1	163.	114.55	73428.45	0.37	2.9353E 02	0.	0.
NS	2	1	192.	111.35	58537.65	0.41	3.0550E 02	0.	0.
NS	2	1	349.	97.07	23180.93	0.66	3.0365E 02	0.	0.
NS	2	1	649.	89.27	12247.06	0.53	3.0338E 02	0.	0.
NS	2	1	664.	94.96	12630.04	0.52	3.1677E 02	0.	0.
NS	2	1	997.	87.91	8412.09	0.64	2.6934E 02	0.	0.
NS	2	1	1299.	88.55	7537.45	0.83	3.0117E 02	0.	0.
NS	2	1	1489.	89.27	6615.23	0.89	3.0384E 02	0.	0.
NS	2	1	2266.	71.64	7709.36	0.82	6.2600E 02	0.	0.
NS	2	1	3049.	46.86	4518.64	1.07	6.5154E 02	0.	0.
NS	2	1	4198.	52.09	4157.91	0.92	1.3923E 03	0.	0.
NS	2	1	5575.	54.76	3852.90	0.96	3.5417E 03	0.	0.

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	4.5102E 02 * 10.44 0/0	0. * 10.44 0/0	0. * 10.44 0/0
AVERAGE OF SIDES	4.5102E 02 * 10.44 0/0	0. * 10.44 0/0	0. * 10.44 0/0

DATA REDUCTION FOR FOIL NUMBER 13 129
MULTIPLE REACTIONS

FOIL LOCATION TEST WELL C-6 OF THE GETR 1A7
TYPE COUNTER GAMMA SCINT BIAS 19 VOLTS BIAS WIDTH

COUNTING DATA

COUNTER SHELF	DECAY TIME (MINUTES)	BACKGROUND (CTS/MIN)	COUNT RATE (CTS/MIN)	STD DEV (PERCENT)	SATURATED ACTIVITY (CTS/MIN-GM(ISO)-W)	SATURATED ACTIVITY (DIS/SEC-GM(ISO)-W)	EFFECTIVE FLUX (N/SQ CM-SEC-W)
NS 5 1	30.	381.07	88984.63	0.34	6.7220E 02	2.5874E 02	1.0533E 05
NS 5 1	32.	381.07	80538.46	0.35	7.0000E 02	2.6944E 02	1.0969E 05
NS 5 1	39.	381.07	48956.32	0.46	6.9516E 02	2.6757E 02	1.0893E 05
NS 5 1	46.	381.07	31478.68	0.57	7.3025E 02	2.8108E 02	1.1443E 05
NS 5 1	770.	415.08	3088.30	1.29	2.9317E 03	1.1285E 03	4.5938E 05
NS 5 1	1421.	386.07	1836.83	1.57	2.8759E 03	1.1070E 03	4.5063E 05

	AVERAGE SATURATED ACTIVITY (COUNTS/MIN-GM(ISOTOPE)-WATT)	AVERAGE SATURATED ACTIVITY (DISINTEGRATIONS/SEC-GM(ISOTOPE)-WATT)	AVERAGE FLUX (NEUTRONS/SQ CM-SEC-WATT)
UNNUMBERED SIDE (US)	0. * 0. 0/0	0. * 0. 0/0	0. * 0. 0/0
NUMBERED SIDE (NS)	1.4342E 03 * 10.24 0/0	5.5204E 02 * 14.31 0/0	2.2473E 05 * 14.31 0/0
AVERAGE OF SIDES	1.4342E 03 * 10.24 0/0	5.5204E 02 * 14.31 0/0	2.2473E 05 * 14.31 0/0

APPENDIX II

AUTOMATIC COUNTER READOUT

Since some counting facilities are equipped with punched card readout systems, the foil data reduction program has a provision to facilitate utilization with these systems. As was noted in the instructions for input data sheet number 5 under "Instructions for Use of Foil Data Reduction Program," an entry is provided for use with automatic readout counting equipment (denoted "Auto CE" on data sheet). For this provision of the program, special input data formats may be used to coincide with the data acquisition techniques. Statements 2120, 2201, 2375, 2383, and 3388 of the source program listing are included for this purpose. As written, these statements are of the form:

```
2120    IF(IAUTO) 121, 121, 121
```

which means that the program will proceed to the indicated statement number if the value of IAUTO is negative, zero, or positive. For utilization of different input formats, the above statements should be changed to the following form:

```
2120    IF(IAUTO) 121, 121, 3120
3120    Read Input Tape 5, 10XX, A, B, C,...
            (Any required executable program statements)

9120    Go to XXX
```

As shown in the source program listing, the program is written to use the standard input data formats except for the actual foil counting data (Format statement 1055 of the source program listing). Source program statement numbers 2201 through 8201 specify that the counting data are to be read into the program on two cards for each foil count. The first card consists of:

The foil number (type, group, and number),
The counter number,
The counting geometry number,
The time at foil counting,
The total number of counts,

The count duration,
The specification of the side of the foil which was counted.

The second card uses the same format except that only the foil type (atomic number) is to be specified and the time at, duration of, and total counts for the background count are substituted for the foil counting data.

If non-zero values are inserted for the foil group and number on the second card, the background data, the following error return will be printed out: "ERROR-SECOND CARD FOR COUNT X NOT BACKGROUND DATA - FOIL NUMBER XXXXXX." If this occurs, the program will skip these data and continue with the next set of counting data. Furthermore, the program determines if the data on the two cards were taken on the same counter; if this is not the case, the error return, "ERROR-BACKGROUND DATA TAKEN ON DIFFERENT COUNTER," is printed out. The program will then continue with the data reduction using the respective counter constants for the counting and background data.

APPROVAL MTP-P&VE-M-62-8

COMPUTER PROGRAM FOR REDUCTION OF NEUTRON ACTIVATION FOIL DATA

By L. K. Zoller

The information in this report has been reviewed for security classification. Review of any information concerning Department of Defense or Atomic Energy Commission programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

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